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What of the Collieries?

CONDITIONS of working in coal mines are such as to give especial prominence to the question of safety. In his evidence before the Royal Commission on Safety in Mines recently the Electrical Inspector, Mr. J. A. B. Horsley, made the point that the increasing use of electricity, in particular for coal cutters and conveyors, had not been accompanied by an increase in the accident rate that was in any way comparable.

He expects better things still, however, as he is reported to have expressed the view that improvements in design and better understanding in application will result in decreasing hazards with the further use of electricity. This condition is already being achieved above ground, any rise in the total number of accidents tending to be of a non-fatal kind below ground.

Confirmation in detail of these views is provided in the annual report of the Electrical Inspector, which is reviewed in this issue. Too much weight should not be attached to the marked reduction in the number of fatalities in 1935, as one year's figures prove little. What is of much greater significance is the contrast shown in the report between the mounting curve of horse-power installed and the relatively stationary average of fatalities over the last seventeen years.

For the first time in ten years no fatality could be attributed to switchgear and fuses. These are, however, still responsible for most of the non-fatal accidents, with flexible cables and plugs a sinister second. The latter are, however, the real source of danger, since they were responsible for six of the seven deaths last year (fire-damp ignition as well as shock) and for nearly half of the deaths due to the use of electricity during the past ten years. Strict adherence to the new B.S. Specification for trailing cables (No. 708—1936) and the use of earth-leakage protection ought to do much towards reducing this liability.

Most of the accidents are ascribed to negligence or misuse—presumably on the part of men who are not expected to know anything about electricity and who should, therefore, be protected from the risks due to their ignorance. In several cases it would seem that a proper system of inspection and maintenance would have averted injuries to pit workers.

This opens up once more the question as to whether the electrical staffing arrangements are adequate throughout the collieries. In some we know they could hardly be improved upon, but elsewhere those in charge of electrical installations work under great difficulties. Major E. I. David, on behalf of the Association of Mining Electrical Engineers, told the Royal Commission of the pitiably low wages often offered to electricians in the pits, with the consequence that some of the best of them sought openings in other industries. These men are surely entitled to especial consideration, in view of the increase in the contract prices for coal to which the electricity supply industry agreed early this year on condition that the whole of the advance should be passed on as higher wages. In the case of the electricians, it is not only an individual standard of living but the safety of other workers that is at stake.

Even more important is the status of the electrical engineer responsible for the safe working of a colliery installation. As things are, he is not necessarily directly responsible to the manager, nor is his office always regarded in the light that it would be if he were known to possess the qualifications prescribed by the Association of Mining Electrical Engineers as certified under a statutory scheme.

Manufacturers, in co-operation with the Mines Department, have done a great deal to raise the standard of safety of apparatus, but there is at present no guarantee that the elaborate precautions taken in design will not be invalidated in use.

Electricity Thefts

FROM reports which we are receiving from various parts of the country we should judge that there is a serious epidemic of electricity thefts. It was stated at South Shields last week, where nineteen people were summoned for this offence, that the resources of the Corporation Electricity Department were being taxed to the utmost in tracking down the delinquents. One of the accused had the effrontery to suggest that the Corporation should provide meters that could not be tampered with. The only remedy seems to be to make an example of such people as are caught. At South Shields two men with previous convictions were sentenced to a month's imprisonment. This should prove a salutary warning to others who regard a public utility undertaking as fair game.

Importance of Export Trade

THE speeches at the B.E.A.M.A. dinner last Tuesday were entertaining rather than profound, which, of course, was not altogether a bad thing. One important point, however, was stressed by two speakers. Mr. G. H. Nelson, referring to the present activities of electrical manufacturers, said that they must not let their preoccupation with home orders obscure the fact that the industry depended very largely upon its export trade. However busy manufacturers were, some part of their organisation should be allocated to the fostering and execution of overseas business. His appeal was backed up by Capt. Euan Wallace, Parliamentary Secretary to the Department of Overseas Trade, who has recently returned from South Africa. Capt. Wallace drew attention to the fact that South Africa is now our most important customer for electrical equipment, and he expressed his appreciation of the remarkable display arranged by B.E.A.M.A. and the Cable Makers' Association at the Empire Exhibition, Johannesburg, which he considered proved that British electrical manufacturers realised the importance of the Union as a buyer.

Into Thin Air

IF Nature abhors a vacuum, then some of the most striking electrical developments have been made by slighting her preference. Lord Rutherford, in this year's Norman Lockyer lecture, showed how far-reaching have been the results of the invention of the mercury pump in leading to further discoveries that have given us such features of modern life as X-rays, cathode rays, radio-telephony, broadcasting and television. The vacuum employed to give efficient steam-turbine operation seems coarse compared with the 10^{-7} mm. obtained in some electron valves, but the general principle is the same. Without the steam condenser, eight million vacuum-filament and fifty-five million gasfilled lamps, not to mention 2,500 million lamps for the world as a whole (about one per inhabitant), would not be absorbed annually—themselves requiring a high degree of atmospheric exhaustion. Lord Rutherford left his large audience in no doubt as to his belief in the benefits to humanity of the orderly development of research.

Low-Voltage Risks

IN his recently issued report to the Ministry of Transport on the fire that broke out on the Channel Islands boat train in August Col. A. C. Trench attributes the cause either to a hot cinder from the engine or to an electrical short-circuit. As the former seems unlikely to continue as a potential danger on the Southern Railway, with its progressive policy of haulage electrification, the chief interest of the report lies in the recommendations made with a view to preventing electrical fires. An electrical fault could have originated in the present instance only in the system of individual lights, which were teed off a 7/.052 circuit fused at 50 A. The branch cables of 3/.029 had a safe carrying-capacity of only 5 A, but were unprotected by the 5-A circuit fuses which were placed in local control switches. This does not represent present practice of the railway company, the coaches having been built in 1922, but the criticisms have a wider significance in view of the tendency, commented on in the report, to regard a 24-V supply as involving negligible risks compared with one at, say, 230 V, whereas risks of over-heating are liable to be greater. Every part of a circuit should be protected by a fuse that blows before the limits of the current-carrying capacity are exceeded, and in teed systems this would usually call for a cross-sectional area in the branch equal to that of the main.

Come to the Ball

MANY prominent electrical men and women are expected to attend the E.I.B.A. Ball at Grosvenor House on Tuesday evening next, and it seems quite certain that all previous successes will be eclipsed. As Mr. Leslie Sharp said in our last issue, those who attend will undoubtedly get full value for their money—quite apart from that warm glow which proceeds from the consciousness of duty well done. Although most electrical people were already convinced that the Association's cause was a good one the announcement that H.M. the King has consented to become patron sets the seal of Royal approval upon its work and gives it a much higher standing, from which it should benefit considerably. The industry owes a debt of gratitude to Lord Falmouth for his good offices in securing the Royal patronage.

Electrical Fires

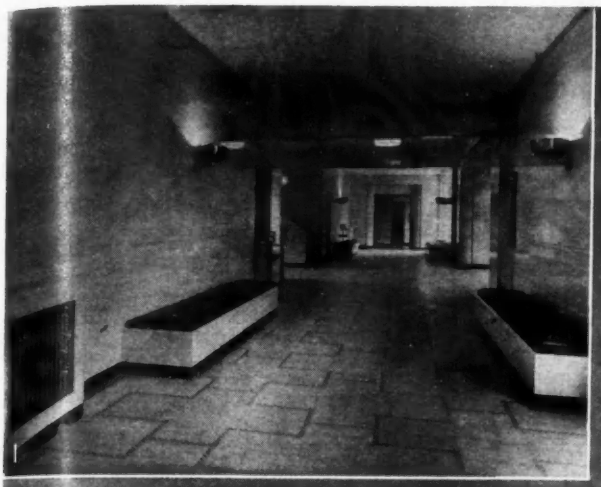
IF a lamp burns out it is said by the consumer to have "fused"; the same term is applied by him even to the flash that may accompany the pulling out of a plug from its socket without first switching off. The value of the real fuse as a safety valve is probably obscured by the misuse of its name in this way, and so if it blows from a legitimate cause the tendency is to replace it by something that will not operate so inconveniently. The experience of Lt.-Col. E. S. Lyon, vice-president of the Institute of Fire Engineers, supports the view of electrical engineers that a high proportion of fires due to electricity arise from this practice. Another common cause, he finds, is contact with gas pipes, but in new premises this ought not to be a contingency. Lt.-Col. Lyon, in pointing out that the quicker a fire can be detected the greater the chance of its being effectively dealt with, pays a tribute to electrical methods of giving alarm automatically. When these have been developed further electricity is likely to prevent far more damage than it causes.

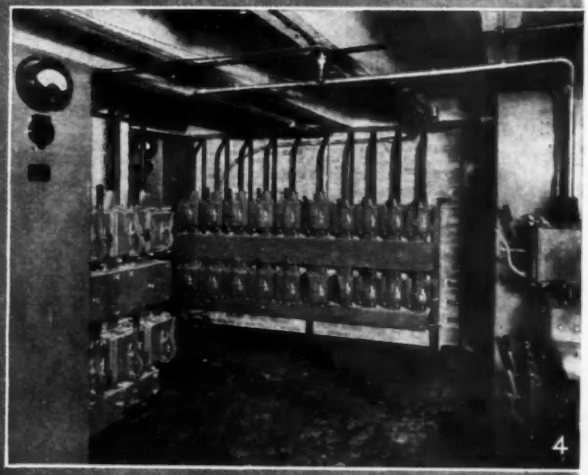
Returning to Normal

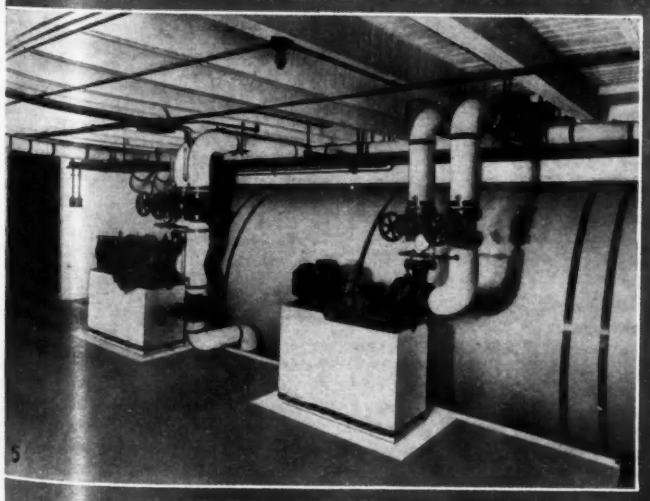
THE extent to which Britain's overseas electrical trade has now recovered from the 1931 slump cannot, of course, be appraised from the figures for one month of the year. Nevertheless, it is interesting to compare the October totals of £1,429,968 (exports) and £451,822 (imports) with the average amounts for the corresponding months of the pre-depression years 1925-30, namely, £1,590,067 and £692,342. Proportionally, imports lag behind much more than exports, although it can safely be assumed that the requirements of the home market are now much greater, indicating that our own manufacturers are better able to cope with the demand. Considering international unrest, our exports last month were eminently satisfactory, for which the Empire, with Argentina and one or two other foreign countries, were mainly responsible.

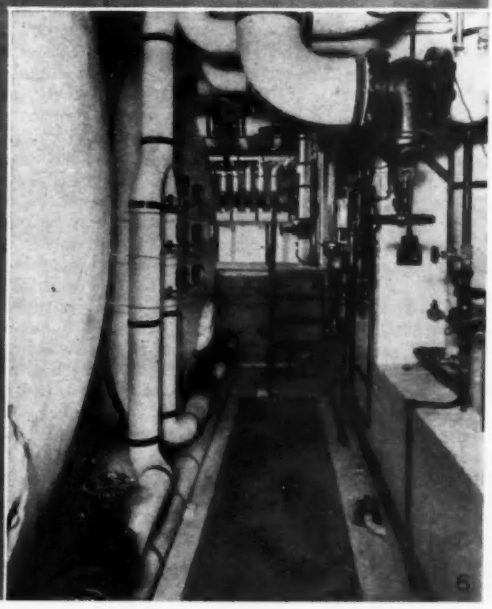
What is the Grid?

THE tendency seems to be growing, even among responsible engineers, to refer to any public supply system as "the grid." This seems to be an unfortunate misuse of a term that was introduced to describe the high-voltage overhead system constructed by the Central Electricity Board for the interconnection of undertakings for the purpose of giving bulk supplies. The Board has published "grid tariffs" as such, and it only adds to the confusion if the rates offered by undertakings to retail consumers (which have to take into account the added costs of distribution) are also called grid tariffs.









The New West Sussex County Offices (See next page)

1. The entrance lobby. 2. Chairman's office. 3. Large committee room. 4. Main switchboard. 5. Thermal storage tanks. 6. Boiler room, showing boilers on left

New County Offices, Chichester

Problems of lighting and heating

THE necessity for an "open office" system and the fact that the Council Chamber, committee rooms and many of the chief officers' rooms are used very infrequently or at irregular hours presented Mr. C. G. Stillman, county architect for West Sussex, with some interesting lighting and heating problems in his design of the new County Offices in West Street, Chichester.

Of modern character the building has a dignified exterior of brick and tile and is planned to provide accommodation for all departments of the County Council, with a total staff numbering about 220, and committee rooms and Council Chamber for upwards of a hundred members. A group system of independent units has been adopted for each department, with localised entrances and stairways, linked together by a central block containing the Council Chamber, committee rooms and county clerk's office.

To facilitate any future alteration to the internal arrangements of the offices plain totally-enclosed spherical lighting fittings have been suspended from the ceilings at 10-ft. intervals in three rows, opposite the windows and regardless of the position of the desks. As this arrangement is bound to be wrong for a certain number of desks, skirting plugs are provided every 10 ft. for desk lamps (Best & Lloyd, Ltd., and Typerlite, Ltd.). The centre row of ceiling lights is controlled from the door, independent switching being provided for the remainder. Apart from the flexibility attained, the scheme has much to be said for it on the score of efficiency and economy, since the use of table standards enables lower wattage lamps to be employed.

A special device has been provided by means of which the two 17,900-gal. storage vessels may be heated up, not only during the night, but also during off-peak periods in the daytime without disturbing the layers of hot water in the upper part of the vessels. Low-speed pumps circulate the water from the storage vessels to the various parts of the building, and pass it through a mixing device, the latter being controlled by means of a variostat. It speaks well for the Bull "Supersilent" motors which drive the circulating pumps that we found them practically cold after six weeks' continuous running.

Fully automatic control is obtained by means of instruments supplied by British Arca Regulators, Ltd., Drayton Regulator and Instrument Co., Ltd., and Ferranti, Ltd. The required internal temperature is reached with a flow temperature of 180 deg. F. if the outside temperature is 32 deg. F., any variation in the outside conditions affecting the flow temperature to the various heating circuits. There is also a further variostat which comes automatically into operation during the night and week-ends, water of a lower temperature being therefore circulated in the building and thus effecting a considerable saving of fuel. The Council Chamber, east and west wings and the south and north sections are provided with independent groups controlled with independent flow and return valves on headers in the boiler house.

Concealed "Ideal Neo-Classic" radiators and special heaters with adjustable fresh air inlets are installed in the Council Chamber, which is also provided with four extract fans inserted in the ceiling. A distant reading of the temperature in the Council Chamber is given in the boiler room by a Negretti & Zambra instrument.

The new offices of the West Sussex County Council in West Street, Chichester

Only three 500-W lamps are used in a G.V.D. laylight (270 sq. ft.) which provides the principal source of illumination for the Council Chamber, subsidiary lighting coming from ten hemispherical indirect spun-metal wall brackets (Starkie Gardner, Ltd.), similar to those used in the entrance hall. The G.V.D. system of controlled illumination is also used to good effect for the laylighting of the anteroom (two lamps only) and for a "sunlit" window on the staircase.

An imposing ceiling fitting of special design has been manufactured by Troughton & Young, Ltd., for the entrance hall, while for each of the two committee rooms two 7-ft. indirect lighting standards (Best & Lloyd, Ltd.) provide the sole means of illumination. Another feature of the committee rooms is the display boards illuminated by tubular strip lamps for exhibiting plans, drawings, etc. Benjamin flameproof fittings have been installed in the medical and veterinary laboratories and except where otherwise stated all the other interior lighting equipment was supplied by Best & Lloyd, Ltd. Emergency lighting for the Council Chamber, anteroom, main entrance and corridors is catered for by means of a Chloride "Keepalite" system.

Although one might imagine that the floodlighting of the exterior of the building is purely decorative, Mr. Stillman assures us that it is based upon utility and economy, since the two Benjamin floodlights used, with two 250-W lamps each, illuminate the large courtyard in a way quite as effective as a number of smaller fittings and at far less cost, both of apparatus and installation.

The main heating for the building is provided by an electric thermal storage plant designed and installed by Sulzer Bros. (London), Ltd. The water is heated by a 800-kW electrode boiler connected direct to the 11-kV, 3-phase, 50-cycle supply (from Portsmouth *via* the Chichester Corporation's mains).

As the committee rooms and chief officers' rooms are not in constant use the hot-water supply has been reduced to give a mere "airing" temperature and stainless steel inset electric fires (Bratt, Colbran, Ltd.) are provided for supplementary warming. The fires for the chief officers' rooms have been specially constructed so that they can be lifted right out into the rooms if desired, while small triangular shields have been placed directly in front of the elements of those fixed in the committee rooms so as to guard against damage to nearby objects.

In order to avoid unnecessary heat losses the "domestic" hot water supply is arranged in two sections, one for each wing, each with its own thermostatically-controlled Heatrae storage heater.

Synchronome electric clocks throughout the building have been chosen to conform with the general scheme of decorations. In addition to the Post Office telephones, about seventy Dictograph loud-speaking telephones are provided, and other electrical features of the building include two self-operated lifts (Waygood Otis, Ltd.), duplicating machines (D. Gestetner, Ltd., and Addressograph-Multigraph, Ltd.), photo-printing machine (B. J. Hall & Co., Ltd.), in addition to a number of laboratory appliances.

The main electrical contractors, Rashleigh, Phipps & Co., are to be congratulated on the neat layout of the main switch-room in the basement. Lighting, heating and power each have their own sections and a separate cubicle is provided for the G.E.C. transformer and switchgear for the 11-kV supply. The latter incorporates a motor-operated switch and a time switch which cuts the supply off between 7 a.m. and 9 p.m.

Pole-mounted Transformers.

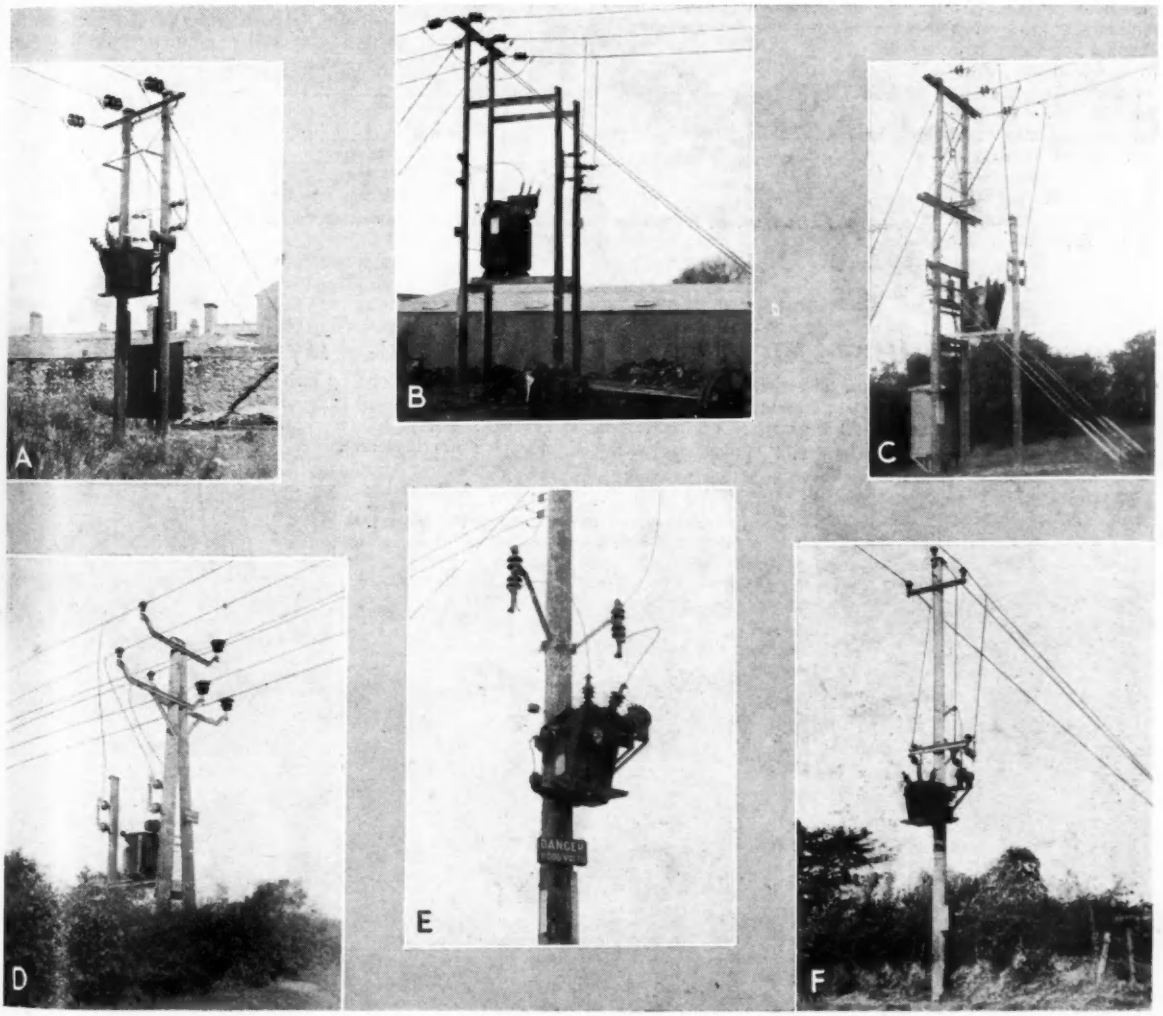
By John McCombe, Ph.D., A.R.T.C.

Their use in rural electrification schemes

HIGH-SPEED development in rural electrification necessitates the installation of transformers on existing high-voltage overhead lines. In large schemes where several undertakings have been merged and several types of construction exist, new transformer positions cannot be standardised to one distinct type of arrangement. Furthermore, higher capacity transformers require special support and means of erection due to their additional weight. Pole-mounted transformers are much cheaper to install than ground-mounted units, which require a concrete raft, protective fence and renting or purchasing of additional ground.

As a result of many years of experience in rural electrification schemes, incorporating single and double and "A" poles, I have attempted to standardise the constructional details for all transformer positions.

The constructional details for installing a transformer on an existing H or double pole are simple, provided the transformer capacity does not exceed 50 kVA at 33 kV or 100 kVA at 11 kV.



A. 50-kVA, 33/0.4 kV with fuse isolation. B. 350-kVA, 33/0.4 kV, four-pole structure. C. A three-pole structure. D. An "A" pole converted to three-pole arrangement. E. Single-phase transformer with fuse isolators. F. A 6.6-kV transformer on a single pole

The poles are drilled and slotted to take the transformer arms, which are held in position by ⅝ in.-dia. bolts passing through the poles. The transformer is supported on the upper channel by strap hangers which are incorporated in the tank design, while the lower arm maintains the transformer in a vertical position.

The transformer arms are 5 ft. 10 in. steel channels drilled at 4 ft. 6in. centres with holes ⅞ in. in diameter after galvanising to take the ¾-in. bolts. The top arm is 5 in. in width with 2½- and 2-in. flanges, both notched to a depth of 2 in. bore after galvanising, each notch being 10 in. long, beginning at 6½ in. from the centre line. The lower arm is of plain 4 by 2 by 2-in. channel.

The transformer is protected electrically by pull-out fuse isolators which can either be mounted on channels or fixed to the pole legs by ⅝ in.-dia. coach screws, the latter method being usually adopted.

As the weight of transformers of greater capacities than those given above is too great to permit the incorporation of hangers in the tank design, the existing H pole is converted to a four-pole structure and the transformer is supported on two steel channels with two additional channels for raising or lowering it, while the fuse isolators are mounted on the pole legs.

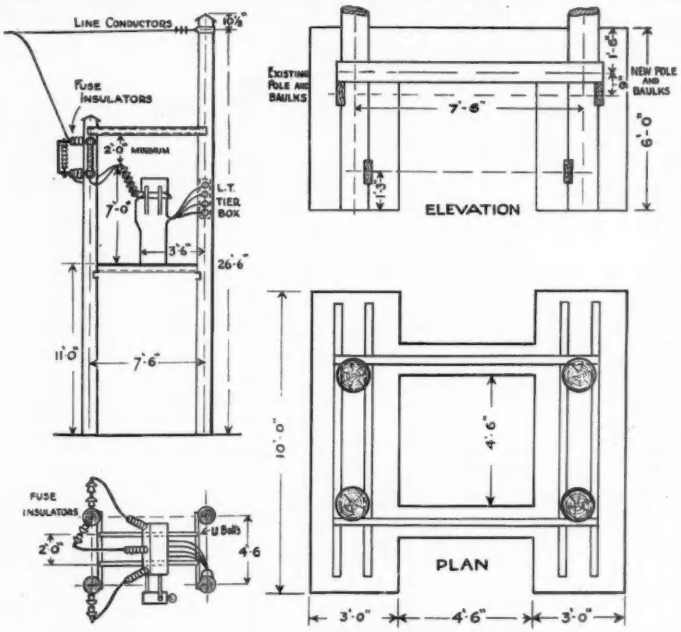
The channels for bracing the terminal and short poles measure 7 ft. 10 in. by 7 in. by 3 in., with ⅞-in. holes drilled at 7 ft. 6 in. centres; those used as transformer supports are similar but undrilled. The supports for the transformer beams differ in being 4 ft. 10 in. long and having drilling centres of 4 ft. 6 in. The stability of this structure depends on the foundation and its arrangement.

A three-pole structure is a stable arrangement for supporting 11 kV and 6.6 kV transformers from 100 to 300 kVA. If the existing pole is of the single type, a double pole is added; and if double, a single one is added. The isolators are arranged on the poles in the most suitable position to facilitate connections and operation. A type that has proved very satisfactory is rigged and erected as two H poles with two cross baulks fitted after erection. Excavations are made as for two H poles and a smaller one for the cross-baulk structures, consisting of six 9 ft. lengths of creosoted wood 8 by 4 in thick.

Mounting a transformer on an "A" pole is not practicable unless another pole is added. The arranging of the centre-phase conductor from the transformer to the fuse isolators, in order to give the necessary phase-to-earth and phase-to-phase clearances, is difficult since the jumper lead cannot be brought through the legs of the pole as in the case of an H structure.

If a pole is added to form a three-pole structure, the arrangement of connections becomes easy. The third fuse isolator can be mounted on the additional leg, thus facilitating the centre-phase connections. The details of the steel work are the same as that for the three-pole structure except that one channel is drilled to suit the legs of the "A" pole. Where the transformer exceeds 100 kVA for 33 kV or 300 kVA for 11 kV and 6.6 kV, a four-pole structure incorporating the "A" pole is used.

Single-phase transformers can be mounted on single poles. A simple and inexpensive method is to erect a channel on the pole from which the transformer is supported by its hangers. To prevent lateral movement and afford additional support, the transformer skid is fitted with a lug having a $\frac{13}{16}$ in.-dia. hole in the centre. A $\frac{3}{4}$ in.-dia. bolt passes through the skid and pole.



General arrangement (left) and foundation (right) for four-pole transfer structure

Transformers up to 6.6 kV can be easily mounted on single poles as the reduced phase-to-phase and phase-to-earth clearances make this possible. The outside-phase fuse isolators are mounted on a channel with an outrigger bracket for the centre phase.

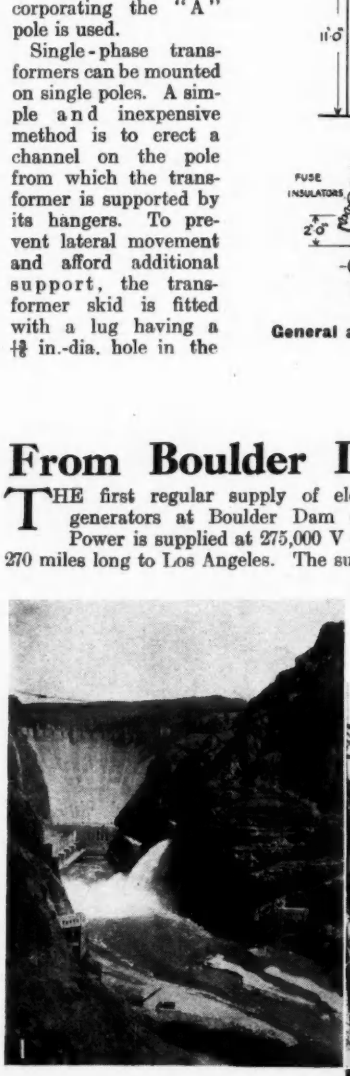
On some schemes both 33 kV and 11 kV transformers are mounted on single poles, but my experience is that this is a practice to be avoided, due to the difficulty of maintaining the necessary clearances required for such voltages. Furthermore, fault trouble is experienced from birds with reduced clearances.

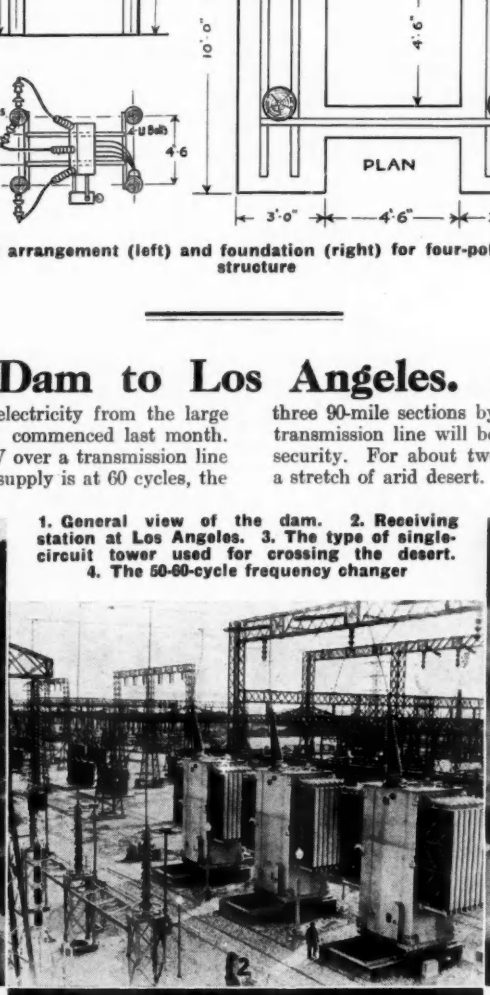
The illustrations which appear on the preceding page show examples of the constructions to which I have referred in this article in actual use.

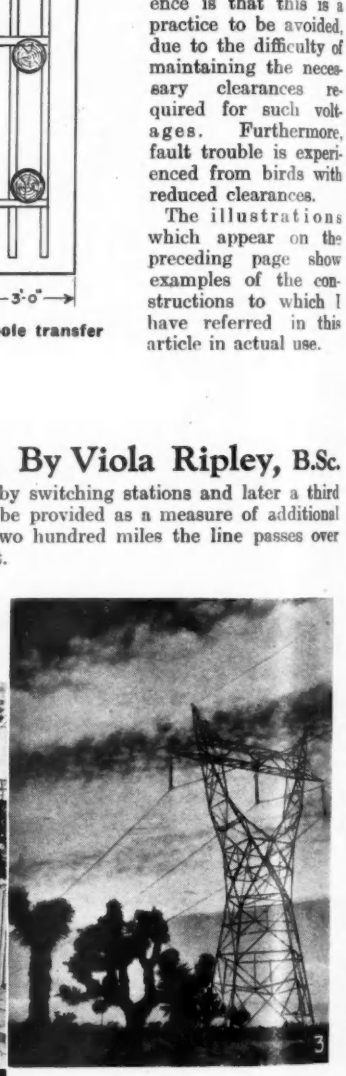
From Boulder Dam to Los Angeles. By Viola Ripley, B.Sc.

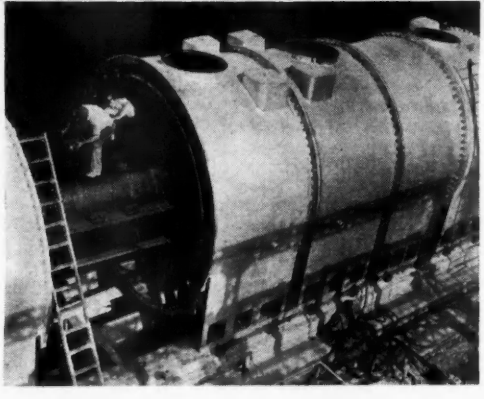
THE first regular supply of electricity from the large generators at Boulder Dam commenced last month. Power is supplied at 275,000 V over a transmission line 270 miles long to Los Angeles. The supply is at 60 cycles, the standard American frequency, and the section of the city which has been converted from the 50 cycles previously used has been supplied temporarily from the local steam station through frequency changers, and these will continue to be used as stand-by equipment.

1. General view of the dam. 2. Receiving station at Los Angeles. 3. The type of single-circuit tower used for crossing the desert. 4. The 50-60-cycle frequency changer









Owing to the popularity of very cheap synchronous clocks, the conversion of these to the new frequency has been one of the biggest problems of the change-over, both from the point of view of organisation and of expenditure.

The transmission line is of hollow copper, 1.4 in. outside diameter, with a view to reducing corona loss. To avoid a shut down owing to a transmission fault, the transmission line is duplicated and also divided into three 90-mile sections by switching stations and later a third transmission line will be provided as a measure of additional security. For about two hundred miles the line passes over a stretch of arid desert.

Here the two circuits are run on separate sets of towers 265 ft. apart as the lightning storms are severe and wayleaves are cheap. In the neighbourhood of Los Angeles there is less trouble with lightning and wayleaves are expensive, so the two circuits are carried on the same towers.

At present there is a minimum monthly charge for electricity for domestic purposes in Los Angeles of 55 cents, or 2s. 3½d. 4.4 cents or 2.2d. per kWh is charged for the first 35 kWh, 2.3 cents (1.15d.) for the next 75 kWh, and 0.75d. for the next 100 kWh. This rate is shortly to be reduced.

When the present works are completed there will be available for Los Angeles 240,000 kVA installed at Boulder Dam.

A Single-phase Sine or Cosine Meter. By H. Lappin

Two methods of employing a kWh meter to serve either purpose

FOR testing purposes it is sometimes desirable to be able to measure with a single instrument the energy used in kWh and the approximate reactive kVAh, and also to know whether the circuit p.f. is lagging or leading.

A sine meter which rotates in the reverse direction with a leading p.f. will indicate whether the p.f. is lagging or leading. When a polyphase supply is available the approximate kVARh may be obtained with a single-phase kWh meter by crossing the pressure connections to get the requisite phase shift of 90 deg. on the meter pressure system. With a single-phase supply it is necessary to have either a special sine meter or some combination of chokes and condensers so connected that a pressure with a phase difference of 90 deg. to the supply pressure may be tapped off for energising the pressure coil of a kWh meter.

The following is a description of two methods of employing a kWh meter to serve either purpose on a single-phase supply and the application of one of those methods to a particular type of meter.

Auxiliary Pressure Coil

Briefly, the first method calls for an extra pressure coil of a few turns wound over the normal pressure coil, and used in conjunction with a small step-down transformer, resistances and a condenser. A change-over switch and plugs in the circuit will determine whether the meter registers kWh or kVARh. Fig. 1 shows the connections of the complete assembly. This method is novel in that the extra or auxiliary pressure coil is from 10 to 20 turns of heavy gauge wire and carries from 2½ to 10 A according to the type of meter considered.

With the second method the only alteration to the meter is the provision of a change-over switch, resistances and condenser; the normal pressure coil is utilised under both conditions. As a sine meter, the pressure coil inductance is negatived by the condenser capacitance; the object of both methods is, of course, to produce a flux in the shunt system in phase, or nearly so, with the supply pressure. In an induction meter the torque is approximately proportional to the product of the shunt and series fluxes multiplied by the sine of their phase difference.

Considering a cosine (kWh) meter with its highly inductive pressure coil (under unity circuit p.f. conditions) the phase difference of the series and shunt currents, and also the fluxes, will tend to 90 deg. (or sine $\phi=1$) and the torque should be the maximum. Conversely, under unity circuit p.f. conditions the sine meter torque requires to be zero, the reactive component being zero. The series and shunt current should be in phase; likewise, the fluxes and sine ϕ being zero, the meter would stand still.

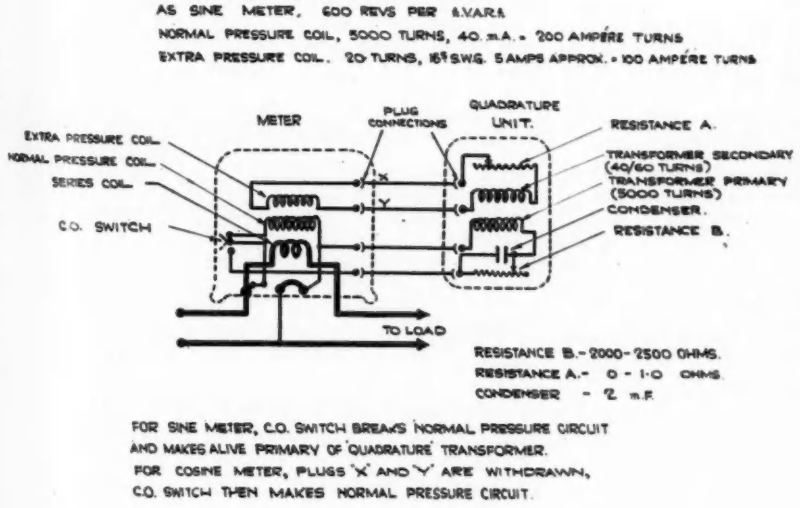
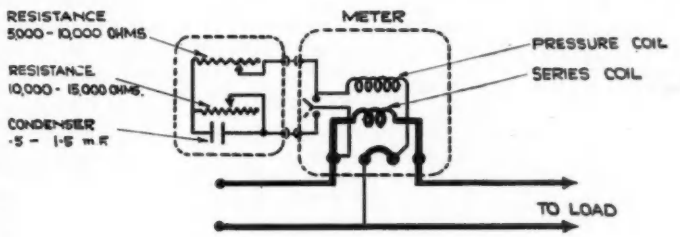

AS COSINE METER, 1200 REVS PER kW.h
AS SINE METER, 600 REVS PER kVARh
NORMAL PRESSURE COIL, 5000 TURNS, 40 m.A. = 200 AMPÈRE TURNS
EXTRA PRESSURE COIL, 20 TURNS, 16 S.W.G. 5 AMPS APPROX. = 100 AMPÈRE TURNS
METER
PLUG CONNECTIONS
QUADRATURE UNIT.
EXTRA PRESSURE COIL
NORMAL PRESSURE COIL
SERIES COIL
C.O. SWITCH
X
Y
RESISTANCE A.
TRANSFORMER SECONDARY (40/60 TURNS)
TRANSFORMER PRIMARY (5000 TURNS)
CONDENSER.
RESISTANCE B.
TO LOAD
RESISTANCE B.- 2000- 2500 OHMS.
RESISTANCE A.- 0 - 1·0 OHMS
CONDENSER - 2 m.F
FOR SINE METER, C.O. SWITCH BREAKS NORMAL PRESSURE CIRCUIT AND MAKES ALIVE PRIMARY OF QUADRATURE TRANSFORMER.
FOR COSINE METER, PLUGS 'X' AND 'Y' ARE WITHDRAWN, C.O. SWITCH THEN MAKES NORMAL PRESSURE CIRCUIT.

Fig. 1

With a circuit p.f. of 0.7071 (cos 45 deg.) the meter should rotate at the same speed whether connected to measure kWh or kVARh, *e.g.*, with similar constants for both conditions, because sin 45 deg. = cos 45 deg. = 0.7071 and the power and reactive components are equal.

One meter adapted to the first scheme was for 10 A at 230 V with a speed of 1,200 r.p.u. It was one of the pre-overload era meters, mainly because the shunt system came easily adrift and there was winding space for the extra pressure coil, and also on account of the extra space available in the meter generally compared with the later types. The normal pressure coil had 5,000 turns and the current taken was 40 mA, giving approximately 200 ampere turns. The extra pressure coil was 20 turns of 16's gauge wire.



AS COSINE METER, SWITCH CUTS OUT RESISTANCES AND CONDENSER.

AS SINE METER, RESISTANCES AND CONDENSER ARE IN SERIES WITH PRESSURE CIRCUIT.

Fig. 2

As a sine meter its "constant" was doubled, giving 600 revolutions per kVARh against 1,200 revolutions per kWh as a kWh meter, thus calling for something like 5 A to give ($5 \times 20 = 100$ ampere turns) through the auxiliary pressure coil in phase or nearly so with the supply pressure, the auxiliary coil being energised from the "quadrature unit." Under sine meter conditions the normal pressure circuit is broken. As a kWh meter the plugs X and Y must be withdrawn, thus open-circuiting the auxiliary coil. The small transformer was actually a meter shunt system (identical with the one on the meter), the coil forming the primary and the secondary being 40-60 turns of 16's wire wound over the primary. The coil was tapped to give 40-45, 50-55, and 60 turns. Obviously, the normal meter adjustments can only be set to suit the cosine meter characteristic, the sine meter adjustments being all made on the quadrature unit, which is very flexible both as to magnitude and phase of secondary current, thereby providing a wide range of adjustment of shunt flux. The low resistance mainly determines the magnitude, and the high resistance the phase relationship or quadrature adjustment. A variable air gap in the transformer iron circuit makes a simple final quadrature adjustment.

For calibration purposes the meter was first carefully checked as a cosine meter; the connections were then changed to give sine meter conditions and, by means of the adjustments in the quadrature unit, it was made to stand still at unity circuit power factor with approximately 5 A circulating in the extra pressure coil (the load was also 5 A at 230 V).

Test Results

With the circuit power factor adjusted to 0.707 lag, further adjustments were made on the low resistance so that the meter rotated (the constant being doubled as a sine meter) at *half speed* in the forward direction (when cos $\phi=0.707$, sin $\phi=707$). Therefore, the registration is approximately proportional to VI sine ϕ, the quadrature adjustment being again checked to correct if necessary for any slight variation due to adjusting

the low resistance. The test results as a sine or cosine meter are given in Table I below.

A similar procedure would be followed with the second method. In calibrating, the first step would be to get the meter to stand still under unity p.f. circuit conditions with a current circulating in the pressure coil that would give the constant desired. If the same constant as a sine and cosine meter were required the pressure coil currents would be the same for both conditions. This would be accomplished with the variable resistances A and B (fig. 2). The resistance and capacity values for either method would vary with the type of meter adapted.

It is very necessary with both schemes that the quadrature adjustment should be as near as possible, otherwise the curve or characteristic will vary between very wide limits. As an example, assume the quadrature adjustment to be 2 deg. out on a meter; that is, the meter stands still with a power factor of cos ϕ = 0.9994 instead of true unity. The torque is then approximately proportional to VI sin $(\phi - 2°) = VI$ (sin ϕ cos 2 − cos ϕ sin 2) ..... (1) instead of VI sin ϕ..... (2) with correct quadrature.

Dividing (1) by (2) gives the ratio kVARh registered to true. The kVARh = cos 2° − 1/tan ϕ sin 2°. The percentage error will be 1 − (cos 2° − 1/tan ϕ sin 2°) × 100 or very approximately = $\pm$sin$a$/tan $\phi \times 100$ (for small values of a) ($\pm$ according to whether angle a lags or leads).

TABLE I.

As cosine or kWh meter at 230 V 50 ~. Full load = 10 A 1,200 revs. per kWh

Load	Full	1/2	1/10	1/20	1/2 at 0.5 p.f.
Errors %	O.K.	1.5+	2.0+	2.0+	0.7+

As sine meter at 230 V 50~ 600 revs. per kVARh

Load = 2,000 VA, p.f. lagging =	0.9	0.8	0.7	0.6	0.5	0.4	0.2	Zero
Errors % ... ... =	1.1−	O.K.	0.9−	0.5−	1.0−	1.0−	1.0−	3.0−

Load = 1,000 VA, p.f. lagging =	0.9	0.8	0.7	0.6	0.5	0.4
Errors % ... ... =	1.0−	O.K.	O.K.	1.0−	1.7−	2.0−

("Constant" being doubled as a sine meter.)

Where sin $-'a$ is the departure from true quadrature (lag or lead) and tan $-'\phi$ is the circuit angle of lag or lead then if a=2 deg. the errors at p.f. of 0.9, 0.7, 0.5 would be approximately 7.0 per cent. −, 3.5 per cent. −, and 2.0 per cent. −.

Of the two methods, the first is more flexible of adjustment, though seemingly more complicated. Also, frequency variation should not affect the accuracy of registration to the same extent as with the second scheme. With any method of measuring reactive volt-amperes entailing the use of capacity in the pressure circuit frequency variations will upset the quadrature or relative phase adjustment of the shunt flux to the supply pressure. The inductance being directly proportional and capacitive reactance being inversely proportional to the frequency, the phase of the shunt flux will vary with frequency and the meter can only be strictly accurate for a given frequency. Considering the first method, the shunt flux can be adjusted to within approximately 30 deg. of the phase of the supply pressure without the capacity. If the meter and transformer or quadrature unit were specially designed, it is probable that the capacity required would be reduced to a relatively low figure and consequently the meter performance with frequency variation would be improved.

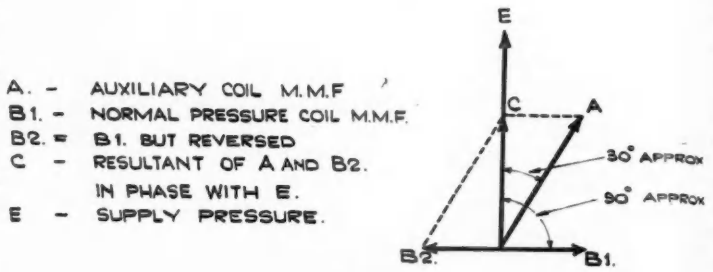


Fig. 3

It might also be possible to dispense with the capacity by energising the normal coil with the connections reversed (the extra pressure coil being, of course, energised) so that the resultant m.m.f. of both windings would have the required phase relationship for sine-meter conditions, as suggested by the vector diagram (fig. 3). The second method gives conditions approaching resonance in the meter pressure circuit and only may be accurate over a limited frequency range.

"Tariff Reform." By Lucia

The art of presentation

THE average retail buyer would take little interest in catalogued goods if the highly priced wares received first place. This is elementary human psychology. Yet the electrical industry as a rule puts forward the most limited and unattractive rates of charging for electrical energy before any other.

A few examples selected at random from a tariff book of British undertakings will suffice to show the method of presentation. Here is one: "Light, first 100 per quarter 7d., over 6d." Yet this authority also offers a not unattractive rate with a standing charge and a kWh charge of 1d. per unit. Another one, often referred to as our most go-ahead supply undertaking, offers: "Light, 4½d., less ½d. for prompt payment" (we are getting on!), while the all-in tariff carries a kWh charge of ⅝d. for all purposes. Yet another authority quotes: "Light, up to 3,000 units per quarter, 3½d." But let us not despair! Upon conducting a thorough investigation we find in hiding a domestic all-in rate of ½d. per unit on top of a moderate standing charge.

An even worse case of a retiring disposition is shown by the undertaking which offers, in the first instance, light at a flat rate of 3d. for the first 500 units per quarter, while it has a two-part tariff under which energy can be obtained at ½d. in winter and ¼d. in summer!

It is surely obvious that the more reasonable terms quoted herein, if put forward in an attractive and readily understandable form, would constitute an excellent advertisement.

The most elementary business methods suggest that the presentation of *price* to the customer calls for first consideration. Usually less price means less quality, but we have the same goods at less money *for those who use more of our commodity*. So why not say so in plain words?

The ideal expression of tariffs should be something on the following lines, the charges being merely illustrations:—

Example One.—All-in rate, ½d. per unit for all purposes plus a quarterly charge of x for service. Unit rate, 1d. per unit for heating, cooking and power. 4d. per unit for lighting only.

It will be noted that the familiar two-part tariff is called the equally familiar "all-in" rate, a much more attractive term. The phrase "flat rate" should not be used; in these days of blocks of flats it might, to the uninitiated, appear to be some special charge for dwellers in these buildings.

Example Two.—Unit rate, ½d. for heating, cooking and power, 2½d. for light only.

This example shows how the tariff of an authority having only a "unit" rate (not *flat*) would be set out.

Example Three.—Sliding scale. First 50 units per quarter at 6d. per unit, all units thereafter at ½d. per unit, for all purposes.

The psychological value of the last example, known as the sliding scale, is so great that every all-in tariff might be quoted in this manner. That is, the standing charge (which could, by the way, much better be called the "service charge") could be covered by the first step of the scale, *e.g.*, the first 50 units quoted above or any other agreed quantity. The second step would be equivalent to the usual unit charge.

With the ordinary two-part tariff we go to great pains to explain to the consumer that the kWh charge becomes less as more units are used. But it doesn't sound convincing. The same tariff in the form of a sliding scale needs no explanation. The all-in tariff may be described as penalising the person who is mean with electricity. Conversely it may be said to benefit the generous user.

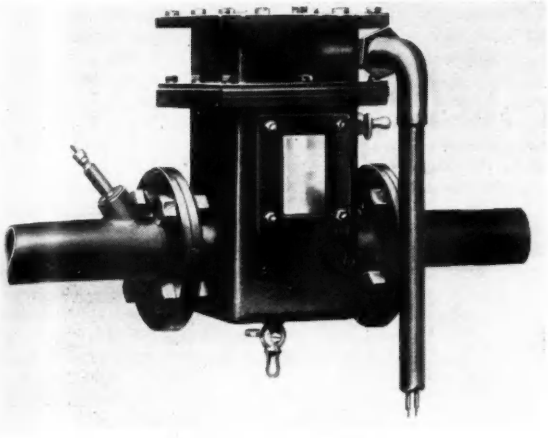
It is not surprising that, with the accepted presentation of scales of charges, we should hear almost daily, "But electricity is so dear in our district!" Quite obviously the dearer rates are generally quoted and this gives the dog its bad name. Perhaps it is superfluous to mention that, in 92 per cent. of the homes of this country, electricity is available at 1d. or under, in 70 per cent. it is available at ⅝d. or under, and in 40.5 per cent. at ½d. or under.

I know of one district in London where those residents who use gas for cooking and heating are probably paying about a third more for their quarter's bill than if they used electricity. Yet they don't know. The tariff folder should tell them. We have the goods at the right price but we lack the art of simple and attractive display. Let us begin with the tariff book.

Transformer Protection

A new type of relay

A NEW protective relay has been developed by the Hackbridge Electric Construction Co., Ltd., for providing a continuous quantitative indication at a remote point of the condition of transformers and similar apparatus, thus enabling such plant to be inspected or withdrawn from service before a fault reaches serious dimensions. It can also be arranged automatically to isolate the plant should a fault develop so rapidly as to preclude prior investigation.

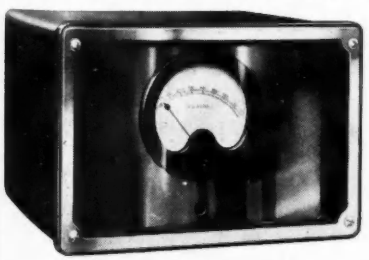


The condenser chamber

The operation of the relay is based on the variation in the capacity of a condenser with any change in its dielectric. Thus, if the normal dielectric of the condenser is oil, its capacity will vary accordingly as the dielectric is changed to air or gas or even to oil of a different dielectric strength. The condenser may be connected in a simple thermionic valve circuit so that any variations in its capacity will cause a corresponding change in the valve anode current which is utilised to give a proportionate indication of such variations on a milliammeter and if these exceed a predetermined amount to operate an alarm circuit.

The condenser unit consists essentially of a multiplate condenser in a steel chamber connected in the pipe between transformer tank and conservator, so that normally it will be filled with oil. The condenser connections are brought out to a terminal board with a weatherproof cover and a conduit entry for the connections between the condenser and valve unit. For use on transformers having no conservator, the condenser chamber is replaced by an inverted box, which is fitted at the top of the transformer inside the tank together with a baffle to guide evolved gas into the condenser.

The single-valve unit is contained in a compact case, which also houses the indicating meter, arranged for mounting on the remote control board. Alternatively the valve unit can be mounted in a case on the transformer itself, with only the meter trip and alarm relays at the remote control point, a common arrangement where the relay is operated from d.c. The single valve is of the same type as is used on railway signalling systems, and normally needs replacement only about every two years.



The relay meter unit

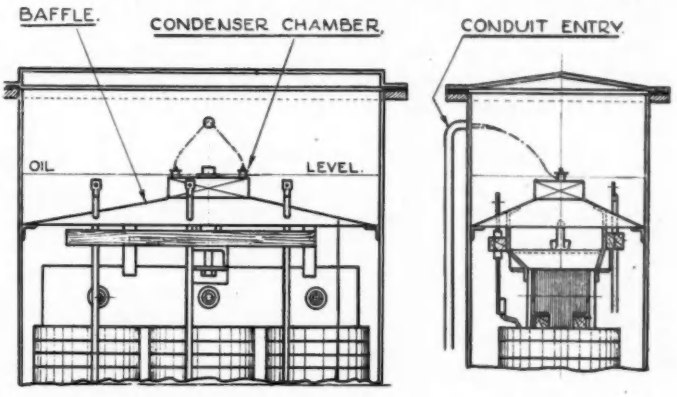
Faults such as creepage over or breakdown of insulation, short-circuited or open-circuited windings or circulating currents in the core give rise to local heating and decomposition or cracking of the oil causing generation of gas bubbles. These in their ascent are trapped in the condenser chamber, where they accumulate at a rate depending on the seriousness of the fault. The oil level in the chamber is thus reduced and the dielectric varied from oil only to a mixture of oil and gas, causing a proportional indication on the remote instrument, which is normally calibrated in cu. cm. of gas. Should the fault continue, the capacity change so increases the valve output as to operate an alarm and/or signal lamp; this normally occurs when 500 cu. cm. of gas (or air) has accumulated.

As in certain cases, particularly when a transformer has just been placed in service, an evolution of air bubbles may cause an indication on the remote instrument, a test cock is provided at the top of the condenser chamber.

Oil leakage from the transformer tank will also cause an alarm to be given as soon as the oil in the condenser chamber falls below a certain level. Discrimination between operation due to oil leakage and that due to electrical faults can be made by inspection of the conservator oil level. Heavy faults, such as an internal short-circuit or a flash-over, cause a sudden evolution of gas setting up an intense pressure. This pressure is transmitted by the oil almost instantaneously to the tank interior and also along the conservator pipe, and operates a simple switching device, connected to trip out the circuit-breaker by opening the condenser circuit, thus causing a relay in the valve anode circuit to function.

The remote indicator is a milliammeter usually scaled in cu. cm. of gas and having a red danger mark at 500 cu. cm. As the valve unit has a small output, even when no gas is present in the condenser chamber, the zero mark of the cu. cm. scale is above the actual zero of the instrument, which is also marked. Consequently, should the auxiliary supply fail or the valve unit cease to function immediate indication of the relay's being out of operation is given by the pointer falling back to actual zero. The indicating meter can be replaced by a recording instrument to give a continuous record.

Where only a periodical indication of the condition of a number of transformers and not full continuous protection is required, one remote indicator and one valve unit may be arranged with a simple selector switch on the indicating panel, so that the gas accumulation for each of the transformers can be read off at regular intervals.



Arrangement of the condenser chamber where no conservator is fitted

This relay is being installed with the most recent of the 93,750-kVA Hackbridge transformers for the Barking power station.

Fires Due to Electricity

OF the 3,675 fires attended by the Liverpool Salvage Corps during the six years from 1929 to 1934, those of undoubted electrical origin have numbered 360. Writing in the *Post Magazine and Insurance Monitor*, Lt.-Col. C. S. Lyon, chief officer of the Corps, states that in each case the cause of the fire is discussed with the officer-in-charge of the Merseyside Fire Brigade and no fire is attributed to electricity if there is sound reason for doubt. In 1934 there were thirty-two causes recorded as "not definitely ascertained," although some were probably of electrical origin. Col. Lyon advocates action by the Home Office, preferably direct, but alternatively through legislation enabling local authorities to act. Electrical defects are due in most cases, he says, to the age of the installations or to careless workmanship. Once an installation has passed its initial test it is seldom again tested unless it is extended or a fire has occurred. Some insurance companies have technical staffs which carry out periodic tests, but only a very small percentage of installations receive this attention. He would have fuse boxes locked or sealed where a qualified electrician was not employed, mentioning cases that have come under his notice in which 5- and 10-A fuses had been replaced by wire nails and steel wire. The two most prevalent causes of electrical fires are given as (a) short-circuits on to lead gas pipes, and (b) breakdown of wiring insulation; both are usually due to bad workmanship. Fires on Merseyside during or immediately following a thunderstorm are rare, but Col. Lyon considers, nevertheless, that legislation should be introduced to make lightning conductors compulsory on all buildings.

Electricity in Collieries

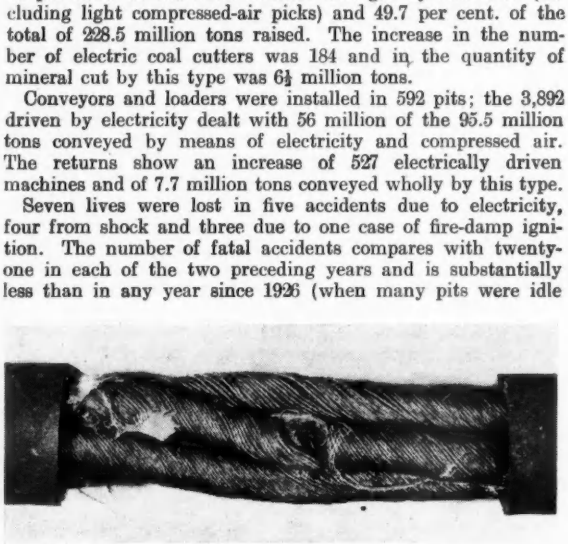
THE annual report of the Electrical Inspector of Mines, Mr. J. A. B. Horsley, for 1935 is now available. (Stationery Office, 1s. 3d.). This deals with the conditions in coal mines, but not in metalliferous mines and quarries, particulars of which were included in a separate report (ELECTRICAL REVIEW, November 6th).

Causes of accidents

Electricity was used in 1,324 of the 2,075 collieries at work last year in connection with 47,460 motors (2,010,000 h.p.), of which 25,480 (1,057,000 h.p.) were below ground. The increase in h.p. over 1934 was 61,000, the same as the previous year's advance. A.c. motors formed 83.8 per cent. of the total h.p. In 844 collieries coal-cutting machines were in use—4,635 electric and 2,837 pneumatic. The former cut 71 per cent. of the 113.5 million tons got by machines (excluding light compressed-air picks) and 49.7 per cent. of the total of 228.5 million tons raised. The increase in the number of electric coal cutters was 184 and in the quantity of mineral cut by this type was 6½ million tons.

Conveyors and loaders were installed in 592 pits; the 3,892 driven by electricity dealt with 56 million of the 95.5 million tons conveyed by means of electricity and compressed air. The returns show an increase of 527 electrically driven machines and of 7.7 million tons conveyed wholly by this type.

Seven lives were lost in five accidents due to electricity, four from shock and three due to one case of fire-damp ignition. The number of fatal accidents compares with twenty-one in each of the two preceding years and is substantially less than in any year since 1926 (when many pits were idle for six months), during which period the h.p. of motors installed has increased by nearly one-quarter.



A damaged screened trailing cable

Sixty-nine accidents causing non-fatal injuries to seventy-one persons (sixty-one from shock) were also reported, in addition to eight injured in three of the fatal accidents. This compares with sixty-two in 1934. Eighteen of these accidents occurred on d.c. systems at from 460 to 550 V and fifty-one on a.c. systems, two at 110 V, one at 5,000 V, and twenty-two at 500 to 530 V a.c., the remainder being mostly at voltages exceeding 600.

One of the fatalities was due to shock received by an electrician in attempting to work on a 3,300-V transmission line which he had reason to believe had been isolated. The deceased had not applied an earthing cable to the line, but it is pointed out that while this is a sound precaution against the possibility of a line becoming charged while men are working on it, such local earthing is no adequate substitute for a permanent structural earthing device at the switch.

The other four fatal and twenty-seven of the non-fatal accidents were associated with trailing cables or plugs. Of the nineteen accidents with such cables, two fatal and four non-fatal occurred with those of the screened type, one being a pliable armoured cable, showing that a flexible screen by itself no more affords absolute protection than does the armouring of roadway cables. Automatic leakage protection is also necessary.

Ill-used Trailing Cable

Deformation of trailing cable can be caused by pulling out a length of cable from a coil lying on its side. It cannot be remedied when once produced, but it can be avoided by flaking the cable in a figure of eight and employing enough men to pay it out and carry it along the coal face or gate road. The ultimate result of "corkscrewing" may be the formation of an elbow in one of the cable cores, which may either fracture or be forced through the tough rubber sheath.

Failure of a screened cable was originated by a fall of stone which pressed a 550-V three-phase trailing cable serving a coal-cutter on to the edge of a gear head, bringing one power conductor into contact with the metal. The neutral of the system was not earthed and leakage protection was not used; the fault current to earth was insufficient to trip the gate-end switch. Examination of the cable indicated that for effective protection of the core the strands composing the screen should be restrained from opening out under pressure from a blunt penetrating object, this is the more important if the screen is near the core.

Earlier damage to a cable by shot firing caused the death of a man when handling a 625-V three-phase four-core t.r.s. trailing cable, from which projected a piece of detonator wire that was in contact with one live core. The slit in the sheath (which was from 0.14 to 0.16 in. in radial thickness) was 0.3 in. long and corresponded to one in the insulation. In the 148 yd. of cable there were eighteen other points that had been damaged by shot firing; bits of detonator wire were found in nine of them and fragments of stone had been driven through the sheath elsewhere. The neutral was earthed.

A pan-shifter was killed and four others received shocks when the edge of a conveyor-pan cut through the sheathing and insulation of a coal-cutter trailing cable. The system was 550-V three-phase with earthed neutral point. The resistance of the earth fault was too high to blow the fuses. The cable was plain four-core with a tough rubber sheath of 0.08 in. radial thickness, and in the 117 yd. of its length the sheath was cut through or punctured in sixty-nine places, at several of which the conductor was exposed. There were also numerous ill-made repairs. To avoid accidents of this nature a flexible cable with an earthed-metal screen and earth-leakage protection should have been used.

An accident not coming within the scope of the Coal Mines Act caused the death of a farmer's boy who attempted to reattach to its fastening a fused stay wire on a transmission line owned by a colliery company which was in contact at its upper end with a 3,300-V conductor. The stay wire should have been attached to the pole below the line conductors. An insulator should be inserted in such stay wires not less than 10 ft. above the ground, unless the earthing of the stay wire and the means of automatic fault isolation can be relied on.

Firedamp Ignition

Ignition of firedamp caused by arcing in the trailing cable supplying a coal-cutting machine resulted in six men being burned, three of whom died subsequently. The electrical system was three-phase at 500 V with neutral point insulated. The cable was screened with twenty-four bare copper braided strands laid in a short spiral directly upon the insulation of the three power cores and in contact with the earth core.

An irregular hole, about one inch in diameter, was burned through the outer sheath, below which twenty-one of the strands were severed with signs of fusion; the underlying live-core insulation was also burned away and the conductor fused, but the other cores (including the earth core) were undamaged.

Corkscrewed trailing cable

The three 16 s.w.g. copper fuses in the gate-end switch-box showed no signs of overheating. Had there been a fault to earth on another phase of the system, the substantial current passing between the live core and the screen at the fault which caused the explosion would have affected the fuses. If there were no such fault, however, the contact between one live core and the screen would not have resulted in arcing; it would merely have brought that phase to earth potential.

It is assumed that on some previous occasions faults had developed at two places on the cable (one at the point of failure which caused the explosion between different phase conductors and the screen and that the fuses were then blown. If the conductor involved in the accident were nearly burned through, the arc accompanying its final severance might have burned a hole through the sheath.

Results of investigations into the causes of twenty-six non-fatal accidents are also detailed. The Report contains fourteen analytical tables relating to causes of accidents and statistical data of coal cutters and conveyors; many of these tables give comparative figures for the last ten years. Appendices give the h.p. of motors installed for each of the principal purposes in the twenty-five districts, a schedule of certificates issued as to flame-proof enclosure, and curves relating the number of accidents to h.p. installed during the past fifteen years.

New Tube Trains

ON Tuesday of this week a trial run took place of the first of four six-car tube trains which are being constructed by the Metropolitan-Cammell Carriage & Wagon Co., Ltd., at Birmingham, to the requirements of the London Passenger Transport Board.

This stock is purely experimental, the design of the equipment having been varied considerably to improve performance. Each train is composed of three two-car units; each car has two traction motors, which with the whole of the electrical equipment are under the car floor, which is at the existing tube trailer car height of 2 ft. 1 in. from the rail level. This arrangement avoids the necessity of switch compartments, and a six-car train will therefore have approximately the same capacity as an existing seven-car train.

Acceleration has been increased to 2 m.p.h. per second, and the braking rate to 3 m.p.h. per second. Three-speed characteristics have been provided: full field running with two stages of field shunting which, while allowing efficient working over the dense central short sections, also makes the train equally suitable for running over the outer or open sections of the lines. The increased acceleration has been achieved by motoring 50 per cent. of the axles, arranging for a greater proportion of the train weight to be available for adhesion and introducing a multi-notch system of traction control.

The mounting of the electrical equipment under the car floor made the usual form of underframe brake rigging impossible. The Westinghouse Brake & Signal Co. co-operated in producing an entirely new scheme of independent wheel braking. The control of the brakes is electro-pneumatic, and an automatic retardation controller keeps the deceleration practically constant over the whole speed range.

One of the new experimental tube trains, showing the driver's cabin (with seat reversed) and the well-appointed interior

All the traction motors for the four trains will be manufactured by Crompton Parkinson, Ltd., and have been specially designed by them to go into the limited space available. They are rated at 138 h.p., giving a total horse-power per train of 1,650 as compared with 960 h.p. for an existing six-car train, and they have Hoffmann roller bearings throughout.

Control is a distinct departure from standard practice. Crompton Parkinson, Ltd., the General Electric Co., the British Thomson-Houston Co., and the Metropolitan-Vickers Electrical Co. will each have a six-car train for demonstrating their interpretation of the multi-notch principle. Crompton Parkinson have put forward three schemes, one for each unit of a train. The first is a series-parallel arrangement using two face-plate controllers, one for each motor circuit, for cutting out the starting resistances, both face-plates being driven by one 50-V pilot motor. Each face-plate has twenty segments arranged in a circle and bridged by a slider arm, which makes one revolution for each of the "series," "parallel," and "weak field" positions, *i.e.*, a total of fifty-seven notches for the complete sequence. An electro-pneumatically operated camshaft contactor makes the group connections to the main motor circuit. Interlock drums on both the face-plates and the cam group ensure correct sequencing. A double-pole line switch, together with pneumatic overloads electrically tripped and set are also included.

For their second scheme Crompton Parkinson have designed a straight parallel equipment, also with a motor-operated face-plate controller, only one of which is necessary in this case. The traction motors operated by this system will be 600-V connected permanently in parallel. The third scheme uses a motor-driven camshaft for cutting out the motor resistances, the cam-operated contactors being arranged on either side.

The General Electric Co. also employs a resistance camshaft, but driven by a 50-V servo motor, and used for series, parallel and field control, making three revolutions from the "off" position to final weak field, a total of fifty-six notches. Series-parallel grouping and the change-over to weak field are carried out by two electro-pneumatically operated cam groups. Three electro-pneumatic contactors are also used, two as line switches and the third for transition. One feature of this scheme is that acceleration is based on time, with an overriding current control which acts on the servo motor field, slowing the resistance camshaft down if the main motor current increases above a predetermined maximum.

The B.T.H. Co.'s American P.C.M. system consists of a number of air-operated units controlled by magnet valves. By a unique arrangement of motor and resistance circuits the camshaft controller is arranged to cut out resistance during series acceleration by rotating in one direction and, after transition from series to parallel, reverses its direction to cut out the resistance again in returning to its "off" position. The camshaft controller is driven by two pneumatic pistons connected together by a rack. Oil under pressure drives the camshaft forward, and air pressure which is locked electrically by the accelerating relay and released under current control, enable the camshaft to advance step by step. A series-parallel transfer switch is provided, consisting of an electro-pneumatic switch with a single air cylinder operating three cam contactors, one of which is normally open, and the other two normally closed. The operation of three contacts by a single unit ensures a quick positive transition without the need for electrical or mechanical interlocking.

The Metropolitan-Vickers scheme uses an oil-driven power drum for performing all resistance switching, giving a total of forty-five notches. The different resistance values are obtained by first cutting the major part of the resistance gradually out of the circuit and then further reducing the values by paralleling. In this way a large number of values is obtained with a comparatively small number of resistance sections and connections. Six electro-pneumatic unit switches are used; four as line switches and two for transition, while the usual form of electro-pneumatic reverser is included.

The following features are common to all the new cars. All the control is operated at 50 V, and each car is separate and complete, resistance switches never being called upon to break under load. The bogies are of all-welded construction, and each carries one traction motor on the inside axle. This arrangement provides 58 per cent. of the available weight of the car for adhesion.

Three of the trains are streamlined at the driving end. The driver's seat is in the centre of the cab, with the master controller and braking controller on either side. The air-operated sliding doors are controlled electrically at 50 V.

The B.E.A.M.A. Dinner

THE Lord Chief Justice of England (Lord Hewart of Bury) was the principal guest at the annual dinner of the British Electrical and Allied Manufacturers' Association held last Tuesday evening at Grosvenor House, Park Lane, which was attended by over a thousand members and guests. The President of the Association, Lord Derby, was again in the chair, and in proposing the King's health gave an appreciation of the late King.

Lord Hewart proposed the toast of "The Association." He said that it was a real diversion for mere spectators to meet those who were engaged in the active and lucrative fields of industry and commerce. Law and the electrical industry had points in common; for instance, both sought to illuminate the dark places in the lives of men and law like electricity might provide shocks to those who resorted to it. Kelvin had said that nobody knew what electricity was; the same might be said of the law. Both were valuable, complicated, and sometimes expensive.

Electrical manufacturers and lawyers, however, rarely met for the Association had reduced litigation to the minimum by its fair conditions of contract, but lawyers had not retaliated by refusing to use electricity. The Association had the confidence of the industry and its customers; its encouragement of standardisation and research was one of its great attributes. The full tide of recovery could not be said to have set in yet, and the electrical industry had a great future. It was his hope that it would continue to flourish and benefit mankind.

In the course of his response, Lt.-Col. R. K. Morcom, C.B.E. (vice-president), said that it was unusual to toast the Association. As a rule they selected a subject which would give the responder an opportunity of grinding one of the many axes in their tool-box. Now, apparently, all their axes were well sharpened, and so they had resorted to toasting the good old tool-box itself. Prosaically, B.E.A.M.A. was a group of soulless entities called companies; but in it there were many individuals who devoted themselves, together with the staff, to loyal service to the members. The members were individuals who had definite ideas of their own. The staff acted like the matrix of a mineral conglomerate, binding together all the hard, soft, small and large bits into a coherent mass. It was not a warrantable assumption, as Lord Hewart had said in "The New Despotism," that the actions of an association reflected the wishes of every one of its members. It was the task of an association to hammer out a common policy to present to the powers that be.

The Importance of Exports

Mr. G. H. Nelson (vice-president) proposed the health of the guests. He pointed out that if he were to devote a minute to each he would speak for ten hours—which he had no intention of doing. Accordingly he classified the guests, making special mention of Lord Hewart. He said that B.E.A.M.A.'s policy of giving guarantees of fulfilment of performance was the reason for its avoidance of the law. He thanked the members of the Government present for their work in promoting trade improvement and the Civil Service which so ably backed them up. The High Commissioners and Trade Commissioners of the Dominions were asked to convey to their countries B.E.A.M.A.'s appreciation of the trade which they gave the electrical industry. After referring to the presence of representatives of the Services, the Central Electricity Board, the Electricity Commission and electricity supply industry, Mr. Nelson made particular reference to the railway companies, who were showing a realisation of the value of electrification, mentioning that 60 per cent. of the Southern's train-mileage was operated over the electrified 26 per cent. of its system.

In conclusion, he paid a tribute to the work of the Department of Overseas Trade, which had made a great contribution to the country's trade prosperity. The Export Credits Department had enabled industrialists to take risks which they could not otherwise have shouldered, and it was all done without costing the country a penny. Export trade was of the greatest importance to the electrical industry. Manufacturers should not be so preoccupied with work for the home market as to neglect their overseas customers. Even in the time of greatest home prosperity they should set aside a part of their establishments for taking care of the export business.

The South African Market

Capt. Euan Wallace, Parliamentary Secretary to the Department of Overseas Trade, said that he had just returned from an official visit to South Africa, where he saw the Empire Exhibition in Johannesburg. The feature of the show which impressed him most was the wonderful display organised by the Association in conjunction with the Cable Makers' Association. The Union was now Great Britain's most important electrical customer, particularly as regarded mining machinery, insulated wires and cables and telegraph and telephone equipment. As Mr. Nelson had said, the great activity in the home market was likely to lead manufacturers to neglect their overseas trade. While the home market must come first, this country could not exist on internal trade alone. It was necessary to dispel the impression which was being spread abroad that British industry was too much occupied with its home business to be able to deal properly with foreign orders. As a means of fostering export business the B.E.A.M.A. scheme for the training of overseas students was of the first importance.

The President's health was proposed by Mr. E. S. New, chairman of the Association, and Lord Derby briefly replied with his customary geniality.

New Tube Trains (*Concluded from preceding page*)

The lighting is by 50 V parallel-burning lamps, a 5-kW motor generator being fitted to each two-car unit. The Benjamin lighting fittings have been specially designed; they consist of fluted oblong shades housed in chromium-plated frames arranged in a line on either side of the centre roof section.

Each car has seating accommodation for forty passengers, and two cars of the first train have fixed double windows, the normal type of ventilator being eliminated, and experimental systems of J. Stone and Crittall forced ventilation will maintain a continual supply of fresh filtered air, thermostatically controlled. During winter months on open sections of the line the air will be electrically heated from the 600-V traction line. The bodies are carried on welded underframes, the main longitudinal members forming air ducts for ventilation.

Silencing devices have been introduced, and the automatic couplers are G. D. Peters & Co.'s "Wedglock" type, which couple automatically the mechanical, electrical, and pneumatic connections, operated by a push button.

Other equipment includes Young batteries, Electro-Mechanical Brake Co.'s compressors, Klaxon windscreen wipers, Clifford & Snell loud-speaker for the driver, and multi-point connection boxes by the Patent Lighting Co.

Extensions and Exhibition at Worksop

THE electrical exhibition held by the Worksop borough undertaking this week at Scofton House was opened on Monday by Sir John Brooke prior to an inspection of the extensions to the electricity supply system. The extensions include the Worksop West sub-station in which are installed 11-kV, 6.6-kV and 400-V switchgear by Metropolitan-Vickers Electl. Co., Ltd., and two 1,250-kVA on-load tap-change transformers, connected star-star and with delta tertiary brought out for low-voltage distribution, by the Electric Construction Co., Ltd. The new sub-station is controlled from a G.E.C. supervisory panel (with illuminated high-voltage system diagram) at the electricity works, where new 11-kV and 6.6-kV switchgear has been provided by the Electric Construction Co., Ltd. Other features of the scheme are an 11-kV kiosk and ring-main isolators, by Crompton, Parkinson, Ltd., 40-kV testing equipment by Ferranti, Ltd., and high-voltage cables by W. T. Glover & Co., Ltd. The whole extension was carried out to the designs and specifications of Mr. M. S. Mason, borough electrical engineer.

Cinema performances and cookery lectures are given daily at the exhibition, where the following firms are displaying apparatus: General Electric Co., Ltd., industrial lighting, health and domestic appliances, poultry farming and agricultural and horticultural equipment; Hotpoint Electric Appliance Co., Ltd., vacuum cleaners and washing machines and other domestic apparatus; Moffats, Ltd., cookers; Berry's Electric, Ltd., "Magicoal" fires and various appliances; Santon, Ltd., water heaters; British National Electrics, Ltd., breakfast cookers; Burnley Components, Ltd., wash boilers and milk boilers; Medical Supply Association, Ltd. In addition to these, information bureaux have been set up by the Worksop Borough Council in collaboration with local contractors, the Electrical Association for Women, E.L.M.A., and the Derby and Notts Electric Power Co.

At a luncheon on Monday the Mayor's health was proposed by Sir Joseph Nall, M.P. (chairman Derby and Notts Power Co.), who expressed his belief that a lasting agreement had now been reached between the Worksop undertaking and his company. Mr. F. Bellinger, M.P., who proposed "The Electricity Supply Industry and the Worksop Exhibition," stated that during the eight years in which Mr. M. S. Mason had been borough electrical engineer the output of the Worksop undertaking had increased from 2,300,000 to 9,100,000 kWh. The undertaking, in conjunction with two local firms, had taken a stall at the next British Industries Fair. Sir John Brooke responded, and the function concluded with a presentation to Mr. W. H. Popple from the staff of the Electricity Department to commemorate his thirty-five years of service.

Meetings and Discussions

The use of aluminium as a substitute for copper was dealt with on Tuesday by Mr. C. H. Ridpath before the A.S.E.E. Communications form the subject of two I.E.E. papers which we review below, while at a recent informal meeting of the Institution Mr. J. A. Sumner deprecated the methods of comparing rural and urban electricity supply costs and revenue which are usually employed.

Aluminium Bus-bars

IN the course of a paper read before the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS in London on November 17th, Mr. C. H. Ridpath stated that 25,000 miles of aluminium overhead transmission lines had been erected in this country during the last decade. The author's purpose was to describe the use of this metal in bar and rod forms for bare feeders and connections. He pointed out that the electrical conductivity averaged, in this country, 60.6 per cent. of the international annealed copper standard.

The strength of extruded bar was not great, but its rigidity was superior to that of the copper equivalent. Owing to its larger radiating surface aluminium would carry more current for the same temperature rise than copper of equal resistance. Aluminium bar might be of the same depth but approximately 1.5 times the thickness of copper for equal capacity, whereas rod need be only 1.18 times the diameter.

The allowable spacing between supports could be 38 per cent. greater than for copper, since the vertical deflection of a horizontal bar under its own weight would be not quite half that of copper for the same span. Aluminium could be bent easily and a high speed should be employed for drilling; paraffin was the best lubricant. Jointing raised no special problem. In some quarters there was a tendency greatly to exaggerate the effect of oxide film on aluminium. If sufficiently pure metal were used and the joint pressure were adequate the film would not thicken to a harmful extent. For thin strip stout steel washers of a greater diameter than the bolt head should be employed.

Contact resistance could be lowered by first smearing with vaseline and then rubbing with emery, finally clamping the bars without removing the vaseline, which prevented the oxide film reforming. Vaseline would also avert aluminium-copper contact corrosion due to moisture in the air. Joints which had lasted for twenty-four years were illustrated.

The lightness of aluminium facilitated the erection and handling of large sections, and there was real economy in the cost of the bars themselves. The weight ratios were 1 lb. of aluminium to 2.19 lb. of copper bar or 2.4 lb. of rod. With aluminium at 1s. 0½d. per lb. and copper at 8d., the cost ratio was 1s. 0½d. to 1s. 5½d., showing economies of 28.5 per cent. (bar) and 32 per cent. (rod).

The author illustrated many typical installations in G.P.O. automatic telephone exchanges, railway and municipal substations, and in ships; also vertical feeders in ducts in buildings, one of which had been completed while another was under construction in London. The author stated that four-core armoured insulated cable to carry 800 A cost 10s. per ft., and the equivalent run of four bare aluminium bus-bars cost (with insulators) 5s. per ft.

Mr. Ridpath concluded by describing the economy (quoting schedules of costs) and other advantages of this system as applicable to two typical cases of a block of offices or flats with a load of 500 A (aluminium £44 13s. 6d., or armoured cable £78), and a four-floor factory installation for a load of 2,000 A (aluminium £55 17s. 6d. or insulated cable £112 19s.).

Trunk Telephony

THE paper by Mr. H. M. Wells on the London trunk telephone exchange, which was read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on November 13th, describes how the rapid growth of the telephone service has necessitated remodelling many of the operations in trunk working.

The cables and associated amplifiers are arranged on the four-wire system, *i.e.*, one pair of wires is used to carry outgoing speech while a separate and distinct pair carry incoming speech. This allows practically unlimited amplification to be introduced into any one trunk and, hence, extends the range of transmission to very wide limits. Speech on the London-Moscow circuit is as good as that on a local (London) call.

Copper versus aluminium
Telephonic transmission
Improved telegraphs

Cables employed for telephone work are of a construction peculiar to communication work. Paper and air-space are employed as insulators, the advantage being that the air-space is filled with an inert gas, usually CO_2, which possesses desiccating properties and which may readily be pumped out of a section of cable and replaced by fresh gas capable of restoring the dry atmosphere necessary for maintaining a high insulation resistance. The physical construction of the cable is of the "star quad" variety, *i.e.*, a number of groups of four wires, which carry the go and return speech paths.

The speed of working the "demand" system necessitates that only one operator shall handle the call at the London end. In other words, every operator must have all the main trunk lines within her reach. This is achieved by paralleling the groups of trunk lines around the switchboard. To show which of these lines is engaged by an operator in another part of the switchroom and which are idle a device known as the "free line signal" has been developed. This, by means of travelling light, indicates the next idle line which may be used.

In the trunk exchanges all calls are timed automatically. The particulars from the time-recording instruments, together with the called and calling subscribers' numbers, are entered on a ticket by the operator and circulated to a central pricing position by means of pneumatic tubes.

Inland Telegraphy Improvements

DETAILS of many of the engineering developments which have taken place in the inland telegraph service of the British Isles during the last few years are given in the paper by Messrs. L. H. Harris, E. H. Jolley and F. O. Morrell (of the G.P.O.) which was read before the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 19th.

Some account is included of the theory and nomenclature of modern telegraphy and also of the application of a.c. to telegraph transmission. In the case of telephony, voice-frequency signalling methods and improvements in transmission technique have led to the extension of the automatic system to include the trunk circuits, so reducing the delays and costs of intermediate operating. Similarly, in telegraphy, the elimination of probably 50 per cent. of the operating transactions and delays would be possible by means of through automatic switching from the office of origin to the delivery office. The present voice-frequency network makes a framework for such a scheme, which would have been completely impracticable under the old physical line conditions. Telegraphy is now in a position to share in the rapid advances made in the telephone field, and its development need no longer suffer from the isolated nature of the plant and technique upon which this important branch of the telecommunication art until recently depended.

Although the recent reduction in telegraph rates has reawakened interest in the public telegraph service and has resulted in an increase in inland traffic of some 36 per cent., it is in the private teleprinter services that continual progress is assured. The teleprinter, with its typewriter keyboard, the elimination of the distance factor by voice-frequency methods, the stability provided by underground cables, and cheaper private-wire telegraph rentals, has placed at the disposal of the commercial world a new tool well in keeping with its modern tendencies.

The introduction, four years ago, of modern machinery and methods was an unqualified success and had a far-reaching effect. The main features of the changes were the standardisation of the teleprinter for telegraph circuits and the concentration under specially trained staff of all subsidiary and testing apparatus on racks segregated from the instrument room. Economies in staff and in space, together with increased stability of apparatus, resulted from these changes, but the network of cables and overhead lines remained unchanged.

The use of underground cables solely for d.c. telegraphy was wasteful, since if a.c. amplifiers and filters could be applied the full frequency range of such circuits would be made available.

When, four years ago, "on demand" long-distance telephony was introduced a shortage of trunk circuits was created. Accordingly, for technical and economic reasons, it was decided to convert practically the whole of the inter-urban telegraph network to voice-frequency working and to utilise the telegraph cables so rendered idle for telephone purposes. The number of such channels at present totals 1,000.

This transfer from physical lines to v.f. channels completed the revolution which had taken place in the telegraph service, and by 1934 hardly an item of traditional telegraph plant remained in the inland service. Concurrently, the private teleprinter services, which had been introduced in 1932, had also progressed. In particular, the simplex point-to-point teleprinter service (tariff A), which includes provision and maintenance of the teleprinters, has been very successful. There are now more than 300 such circuits, and they produce a substantial revenue.

Cable companies, news agencies, and newspapers make considerable use of duplex point-to-point circuits for speeds up to 100 words per minute Wheatstone, or the equivalent. These circuits (tariff B) are provided almost entirely by means of v.f. channels, and such important circuits as direct extensions of Atlantic cables are numbered among them. Some 58 full-time and 22 part-time circuits of this type are in operation.

Numerous privately rented circuits remain on physical circuits where these are still available and where the renters have special requirements or use speeds greater than 100 words per minute Wheatstone. An increasing number of newspaper companies now rent telephone circuits on which they provide or rent equipment for alternative speech or pictures and multi-channel v.f. telegraphy.

The telex service, giving the alternative of teleprinter working to speech over the telephone network, as distinct from a separate teleprinter exchange system without the alternative of speech, has also progressed. One of its features is "printergrams," enabling telex subscribers to transmit and receive their inland messages direct between their premises and the telegraph office. This service now deals with 20,000 telegrams per week in London alone.

Some controversy has arisen over the relative merits of the two methods of providing subscribers' teleprinter exchange services. While it is relatively simple to provide separate line plant and switches to give a service connecting stations within a limited radius of main centres, it is considered that the telex system has great advantages if a cheap universal system is to be the ultimate aim, with the teleprinter as a mere accessory of the telephone. Important influences affecting the question are the ruling telephone trunk rates and the difficulty of obtaining a good grade of service in the early stages of a separate network. It may well be that a composite system in which telephone exchange lines or separate telegraph channels are used according to the locality and traffic requirements of the subscribers would be ultimately desirable as combining the advantages of both methods.

One of the latest developments of the private teleprinter services has been the introduction of broadcast systems, whereby the central office of a renter can transmit simultaneously to any reasonable number of out-stations or separately, as required, up to the limit of the number of machines provided at the central office. These systems are finding considerable favour with police services and with news agencies. Much of the traffic carried by these new teleprinter services was previously forwarded by post, and the increased revenue arising from these circuits is not offset very appreciably, therefore, by decreased telephone and telegraph revenue.

Rural and Urban Costs Compared.—The relative costs of electrification in rural and urban areas was the subject discussed at the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 9th.

The first speaker, Mr. J. A. Sumner, said that the outlay involved in supplying electricity to rural premises was not necessarily higher. Comparisons were frequently made upon an unfair basis; it was not right, for example, to set the outlay per consumer of an undertaking years old and well established alongside that of a rural system in its very early days—one which might be carrying very heavy capital charges for new and extensive development lines. The basis of comparison should be the total distribution capital expenditure per consumer. It was also essential that a period of time be allowed for the rural system to become established and if the youth of an undertaking did not permit this, then it should be measured against the urban system of, say, 1895. Dealing with the difficulty of defining a purely rural or urban area, Mr. Sumner said that there were few purely rural areas more than seven years old, and he then exhibited graphs of some typical rural undertakings with this relative maturity together with a similar number of urban systems, selected mainly because they had no considerable power load. The conclusions which he expected to be drawn from the curves supported his view that the outlay per connected consumer in each group after about ten years of operation tended to approximate to that of the other group.

Electric Boiler Improvements in Austria

UNTIL last year the administrative building of the Austrian Federal Railways, at Innsbruck, with a cubic capacity of about 600,000 cu. ft. in 180 rooms and 280,000 cu. ft. in stairways, corridors and basements, was heated by steam from two flame-tube boilers. In order to save fuel, an electrode boiler rated at 1,000 kW was then installed, taking a single-phase, 16⅔-cycle supply through 15/1 kV transformers from the overhead system of the electrified Salzburg-Buchs main line. The original arrangement of the electric boiler is shown in fig. 1, from a report on the subject by H. Weinrath in *Elektrotechnische Zeitschrift*. The electrodes, designed for normal current densities and water of a specific resistance of from 1,200 to 1,500 ohms per cm³, were quickly "necked" by corrosion and, after a short period of service, the switching-on current rose to two or three times the nominal value, requiring special protection for the transformers.

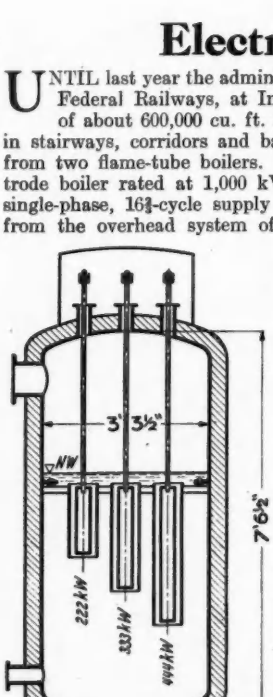


Fig. 1.—Original arrangement of the boiler

Investigation showed that the trouble was not due to the low supply frequency, as first suspected, but to unsuitable form of electrodes. Their small section and relatively great height produced unfavourable conditions for the escape of steam, and at the high loading and low pressure (about 3 lb. per sq. in. gauge) concerned water was largely expelled from the working spaces, resulting in higher current densities. This effect was intensified by reduction in the specific resistance of the water, due to accumulation of impurities, and the increasingly rapid corrosion of the electrodes accelerated the cycle of cause and effect. The nature of the trouble was not, however, evident from the readings of the electrode ammeters, because the increase in current density compensated for the displacement of water as regards the total current value, which thus remained practically constant.

A new type of electrode was therefore designed fulfilling the following conditions:—Minimum resistance to escape of steam; uniform distribution of current density; and simple construction. These requirements led naturally to the experimental arrangement shown in fig. 2. The wider and shorter working space facilitates the escape of steam; corrosion of the electrodes is almost eliminated; and a lower specific resistance

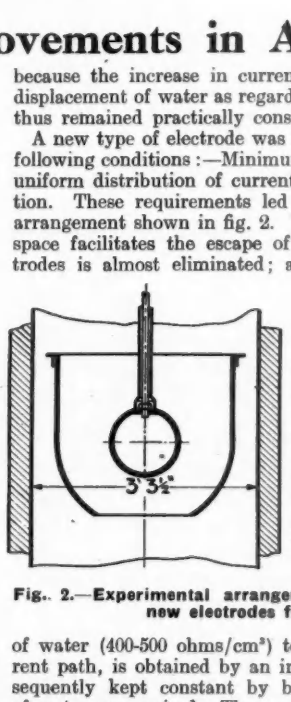


Fig. 2.—Experimental arrangement.

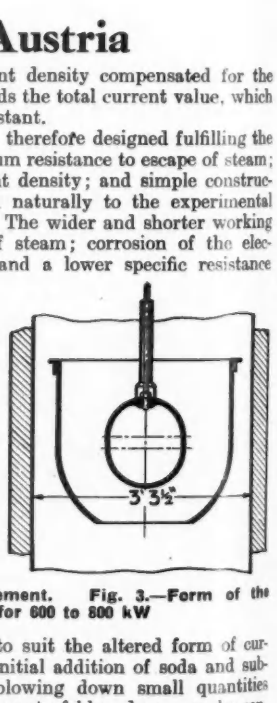


Fig. 3.—Form of the new electrodes for 600 to 800 kW

of water (400-500 ohms/cm²) to suit the altered form of current path, is obtained by an initial addition of soda and subsequently kept constant by blowing down small quantities of water as required. The amount of blow-down can be controlled by the ammeter readings, the current density being proportioned to the conductivity of the water with this type of electrode. The form of new electrodes for 600 to 800 kW is shown in fig. 3. These have given satisfactory service for about twelve months. Tests indicate that the evolution of gas is about 0.5 cm³ per Ah, consisting of 60 to 80 per cent. nitrogen, 20 to 30 per cent. hydrogen and only traces of oxygen. Practically the whole of the oxygen combines with the electrode material without causing any appreciable wear, and under no circumstances is an explosive mixture of gases formed.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The Lighting of Trunk Roads

Section 6 (4) of the Trunk Roads Bill, copies of which have just become available, empowers the Minister of Transport, if he considers that any trunk road should be illuminated or better illuminated, to make arrangements for such means of illumination as he thinks necessary for the purpose. Assuming that this Bill becomes law, the electricity supply industry will have an invaluable opportunity of demonstrating what can be done even outside the large towns when adequate funds are available for this purpose.

In the rural areas many parish councils are doing their best, but when a 1d. rate produces only perhaps £25 a year or less the provision of adequate lighting is clearly beyond their means. When the Road Fund becomes available, however, for lighting trunk roads, the intensities of illumination recommended by the British Standards Specification will become practicable.

Recent technical developments have rendered obsolete most of the available literature on the subject, and at this juncture it would be most helpful to have a paper read before the Institution of Electrical Engineers and discussed not only in London, but also at the various local centres. E.L.M.A. might also produce a comprehensive report embodying the latest available information, somewhat on the lines of Mr. C. C. Paterson's presidential address to the Junior Institution of Engineers on the subject of "Modern Street Lighting" delivered in December, 1934.

There is a further important aspect of the matter affecting those rural areas through which the proposed trunk roads pass which must not be lost sight of. The provision of extensive schemes of road lighting should enable many villages to receive a supply of electricity forthwith, which could not otherwise be supplied economically for many years to come.

R. ALAN THWAITES.

Wrexham, *November 13th.*

The Propulsion of Liners

With reference to the article on electric propulsion by Mr. A. Regnauld which appeared in last week's issue it would indeed be gratifying if the committee which has in hand the powering of the sister ship to the *Queen Mary* could be persuaded to adopt the electric drive. But has a case been proved for it?

The advantage of being able to reverse at full power has been questioned, as no officer in charge of a fast ship would risk reversal at full speed for fear of damaging the rudder, though my own opinion is that there are times when the ability to use all available power for reversing would be an advantage, as when the *Titanic* struck an iceberg with the loss of many lives.

The main advantage of the electric drive on ships is when cruising, but as the *Queen Mary* and her sister ship "No. 552" are designed for a specific purpose, that of maintaining a fortnightly service between Cherbourg and New York going at practically full speed all the time, the direct geared-drive turbine seems to have an advantage over the electric drive.

The electric drive was adopted for the *Normandie* not so much for economy as for the comfort of the passengers, as there is no vibration or noise from gearing and, I suppose, better control. Mr. E. Roth in his paper on the *Normandie* before the Institute of Marine Engineers sums up the advantages of turbo-electric propulsion by stating "that the use of turbo-electric propulsion in large ships offers the following unquestionable advantages: reduction of noise and machinery vibration; fuel economy over a wide range of speeds; and possibility of proceeding with the inspection of machines without stopping the vessel."

Some time ago an article in a Liverpool paper referred to the powering of the *Queen Mary*, stating that the committee was justified in deciding to use the geared-drive turbine in preference to the turbo-electric drive on the ground that the latter had not been tried. In the United States Navy there are two ships, the *Lexington* and *Saratoga*, which were originally designed as battle cruisers, but were turned into aircraft carriers. They are over 800 ft. long, over 200,000 h.p. each, and have a speed of over 32 knots. They are electrically driven and have been running successfully for over ten years.

Liverpool, *November 16th.* CHARLES RETTIE.

Referring to Mr. Regnauld's article, it is of great interest to find the electrical fraternity now claiming the possibility of a 5 per cent. better efficiency for the turbo-electric drive as compared with single-reduction gearing. It would be of greater interest still if they could claim equal weight and capital cost.

The statement made in the penultimate paragraph of the article, suggesting that a large vessel could have a central power station with common bus-bars for all purposes, including propulsion, has been made on several occasions. The propellers are, however, driven by synchronous motors, and when the speed is altered the frequency also must change. This is done by changing the speed of the turbo-alternator, the control apparatus acting through the medium of a specially designed adjustable governor on the steam supply to the turbine.

In manœuvring it is necessary to have the port and starboard machines under independent control. To reverse one set of propellers, for example, the corresponding turbines are lowered in speed, and, when the frequency and voltage are low enough, the motor excitation is reversed and the speed built up again by increasing the frequency and voltage. How is this to fit in with a system of generators in parallel on common bus-bars? Even when the vessel is running at reduced speed with half power, the frequency must be lower than when it is at full speed, and this would not work in with any system of fixed frequency.

From every point of view the auxiliary and hotel service should be kept independent of the main propulsion. The present arrangement has not been arrived at without due regard having been paid to the conditions of service, involving day, evening and night loads at sea, and day, evening and night loads in port when the ship is almost empty.

I think a strong point in the case for turbo-electric propulsion is the low maintenance cost. I visited the *Normandie* at Le Havre while there was a small army of men on board stiffening the structure against vibration, and found hardly a soul in the machinery spaces. Everything seemed to be as it was when the vessel came to port, and there would be little or nothing to do before proceeding to sea. The upkeep must be comparatively trifling and the depreciation of the electrical machinery nominal.

GILBERT AUSTIN.

Glasgow, *November 16th.*

Trailing Cables for Excavators

The Mines and Quarries Report for 1935 states that plain tough-rubber-sheathed flexible cables without an earthed-metal screen should not be used, even at medium pressure, for supplying electricity to large excavators in quarries and clay pits, and you commented on this in your editorial columns. In an appendix recommendations are made concerning the construction of trailing cables, the electrical protection of circuits and other matters. Previous reports have given similar warnings and recommendations, although not in such detail; and yet year after year there is a consistent lack of accidents in clay pits due to plain tough-rubber-sheathed excavator cables.

Does the "concern" which the use of these cables is said to cause arise from actual or from hypothetical accidents? In either case, the insistence on pliable armouring, cradle centre and earth-leakage protection is difficult to understand when one recollects that large excavators with plain t.r.s. trailing cables and without earth-leakage protection have been in use for more than ten years in clay pits where experience shows them to be at the bottom of the list of hazards. The specification given in the appendix was prepared by the chief electrical inspector in collaboration with the Cable Makers' Association. Were any users or manufacturers of excavating machinery consulted? If not, it seems a pity, especially since the recommendations may foreshadow enforced compliance.

The commonest damage to excavator cables in clay pits is crushing, and they should be so constructed as to be disconnected from the supply by a crushing load before the outer sheath is damaged. Speaking from experience, I submit that this can be achieved by laying up the rubber-insulated cores without a cradle centre and with an external sheath of extra-tough rubber, when the application of a crushing load would produce a fault between phases without even marking the sheath and overload protection only is required. I suggest that this arrangement, when used in clay pits, should constitute compliance with any regulations that may be made. It may not be 100 per cent. safe, but no one would claim this for any form of cable construction or system of electrical protection.

The inclusion of a cradle centre tends to prevent the cores from coming into contact with one another, with the result

that a crushing load might damage the outer sheath before internal damage occurred. This consideration leads to the introduction of armouring to reinforce the outer sheath; and since a fault from phase to armour then becomes more likely than a fault between phases, earth-leakage trips are necessary to prevent the armour from becoming alive and an external rubber sheath is added as a means of guarding against corrosion.

Since earth-leakage protection depends upon the conductance of the circuit between the armour and the neutral point of the system and on the condition of the leakage trip itself, I suggest that the possibility of deterioration of either or both of these makes the armouring a source of danger, because a failure of the leakage trip to operate would make the frame of the excavator alive through the armouring and the internal earth conductor would then be of no value, since sufficient current could not pass to the neutral point to maintain the excavator frame at about earth potential.

The plain unarmoured t.r.s. cable, without a cradle centre, has minimum diameter, weight and cost; maximum flexibility and simplicity; is easy to repair; while after years of experience I have no cause to regard it as more dangerous than other clay-pit equipment. The addition of complications creates a danger when maintenance is inadequate. Where conditions are so severe that the cable sheath must have steel protection the risks introduced by the use of armour must be understood and continually watched. If special regulations are made for excavators and other mobile equipment I trust that the inspectors concerned will hesitate before imposing complications which, in certain circumstances, will defeat their own object.

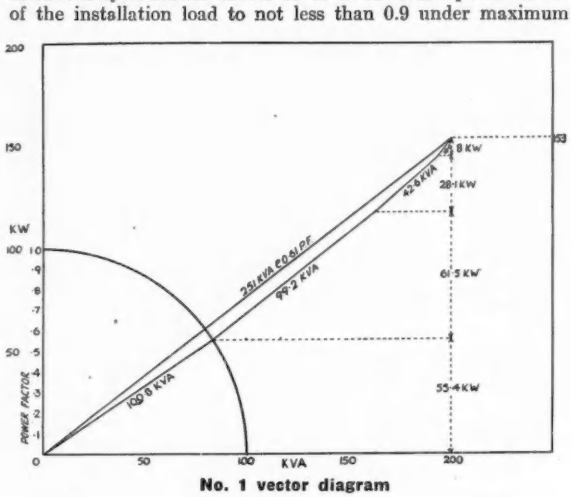
J. V. PEACOCK.

Bedford, *November 16th.*

A Power Factor Correction Scheme. By H. Neale

Overcoming difficult conditions

POWER-FACTOR correction for an industrial installation on which the load is of a fluctuating nature, or of low average value, is seldom a clear-cut issue, as in the case of an ice-making plant recently dealt with. On changing over from d.c. to a.c. supply it was desired to include a synchronous motor so as to raise the power factor of the installation load to not less than 0.9 under maximum load conditions. The main part of the load comprised very low speed air and ammonia compressors, directly coupled to their driving motors, so that the replacement a.c. induction motors would necessarily have relatively low power factors.



No. 1 vector diagram

Table 1 is a list of the new motors, showing their performance figures and the kW input at full load for each machine. It will be seen that the total demand load is approximately 300 kW. As the air compressor runs continuously a synchronous motor was selected for this. To avoid alteration to the distribution wiring and the gearing on the crane and lifts, it was decided to retain the existing d.c. machines and install a 15-kW motor-generator set. The whole load is naturally a "seasonal" one, the maximum during midsummer being 188 kW. As the total a.c. demand load, based on induction motors throughout, gave a figure of about 300 kW, the percentage average load appeared to be relatively low.

TABLE 1.

Drive	B.h.p.	Type of motor	Performance	Full load	¾ Load	kW Input: Full load	kW Input: ¾ Load
Ammonia compressor.	44	Slip-ring	Power factor	0.72	0.66	37.5	28.1
			Efficiency %	87.5	87.5		
Ammonia compressor.	95	Slip-ring	Power factor	0.69	0.62	81.5	61.5
			Efficiency %	87.0	86.5		
Ammonia compressor.	85	Slip-ring	Power factor	0.67	0.55	73.75	55.4
			Efficiency %	86.0	86.0		
Air compressor.	40	Slip-ring	Power factor	0.78	0.72	33.3	—
			Efficiency %	89.5	89.5		
Pumps	3½	s.c.r.	Power factor	0.68	0.63	3.2	—
			Efficiency %	81.5	81.5		
Pump	19	s.c.r.	Power factor	0.88	0.85	16.1	—
			Efficiency %	88.0	88.0		
Pump	19	s.c.r.	Power factor	0.88	0.85	16.1	—
			Efficiency %	88.0	88.0		
Pump	1	s.c.r.	Power factor	0.74	0.64	1.04	—
			Efficiency %	72.0	70.0		
Pump	2½	s.c.r.	Power factor	0.83	0.75	2.3	—
			Efficiency %	81.0	78.0		
Crusher... ...	15	s.c.r.	Power factor	0.87	0.84	12.9	—
			Efficiency %	87.0	87.0		
Motor generator set.	15 kW	s.c.r.	Power factor	0.90	0.86	19.1	—
			Efficiency %	88.5	88.5		
					Total ...	296.79	

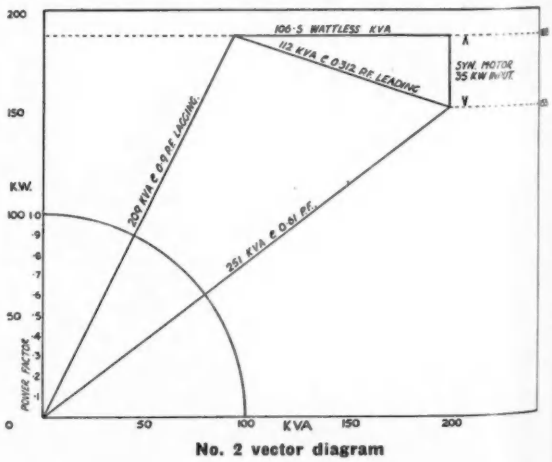
Owing to the unavoidably low power factors at light loads of the larger motors, comprising the main load, it was important to establish the actual loading on these machines, as a starting point for the correction calculations, to determine the probable power factor of the system. Readings taken for the 95-, 85- and 44-h.p. d.c. motors showed load variations averaging about 75 per cent., and tests indicated that the 19-h.p. pump motors, when running, were practically fully loaded. Thus average p.f. conditions would occur with the three large motors running on 75 per cent. load, plus the continuously running 40-h.p. air-compressor motor and a small residual load.

At times, when either or both of the 19-h.p. pumps, or the m.g. set would be in operation, clearly one or more of the larger compressor drives would be shut down, since the maximum loading on the plant did not exceed about 188 kW. Further, the 19-h.p. pump motors (which, when running, would be fully loaded) had a relatively high power factor, as also had the m.g. set motor.

To arrive at the power factor of the induction motor load of 153 kW (145 plus 8) the No. 1 vector diagram was drawn, establishing the lagging power factor as 0.61. The kVA rating of the synchronous motor and the leading power factor at which it will operate were determined by constructing the vector diagram No. 1, allowing an input of 35 kW. The motor, therefore, had to have a continuous rating of 112 kVA and inject 106.5 wattless kVA, operating at a power factor of 35/112 =0.312 leading, in order to correct the power factor of the load to 0.9 lagging. The final condition is, therefore, 188 kW at 0.9 lagging, *i.e.*, 209 kVA.

TABLE 2.

Drive	kW	Power factor
95-h.p. motor at 75% load	61.5	0.62
85-h.p. motor at 75% load	55.4	0.55
44-h.p. motor at 75% load	28.1	0.66
Total	145.0	
40-h.p. synchronous motor on full load ...	35.0	
Balance	8.0	(say) 0.75
	188.0	



No. 2 vector diagram

During the winter months, when the total load is as low as 102 kW, the motor will be capable of raising the system power factor to unity.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Combined Lighting and Heating Units

The "Heatlite" floor standard of HARCOURTS, LTD., 21A, Newman Street, Oxford Street, London, W.1, is a further development in the principle of combined lighting and heating. It is of tubular metal, and on the stem is a 1,000-W element independently controlled and mounted in the form of a spiral. The actual element is of the metal-sheathed type so that no live parts are exposed, and is guarded by a series of parallel discs. For lighting, a reflector is provided at the top; a 60-W lamp is provided for upward illumination, three 40-W lamps giving a diffused general lighting. These are controlled by two separate switches. The standard finish is chromium plate and the height is 5 ft. 6in.

Combined heating and lighting is also the feature of the new "Unity" model of UNITY HEATING, LTD., Welwyn Garden City. It is rectangular in shape and is suspended from the ceiling by means of two vertical tubes. Although two parallel striplights are used as the source of illumination in the standard model, there are many variations to suit any particular scheme.

The "Unity" (above) and "Harcourts" (right) combined lighting and heating units

Adjustable Lamp Brackets

New designs of its adjustable lamp brackets have been introduced by the TYPERLITE COMPANY, 86, Cannon Street, London, E.C.4. Model 1.BD, designed for use with typewriters, consists of a stout wooden board, felt-lined top and bottom, and fitted with two sunken metal containers for holding pins or paper clips. The "Typerlite" standard is screwed to the baseboard and is adjustable to any angle. Model 10 is a table standard fitted with a heavily weighted circular base, the whole fitting being finished in bronze, complete with a metal conical shade and ready wired. A similar design is available (known as model 11) but fitted with a square step-up base. As an alternative to Nos. 8 and 9 there has been introduced an omni-directional swing wall bracket with a "stay-in position" joint.

Model 1.BD. "Typerlite" fitting

Domestic Apparatus

Profiting by the favourable conditions for importing, S.L.R. ELECTRIC, LTD., 17, Hanover Square, London, W.1, is now marketing a large number of Canadian-made domestic appliances.

Of particular interest is the "Brock" chromium-plated coffee percolator set comprising a percolator of modern design, cream jug, sugar basin, and a tray inlaid with "Micata," a black heat-resisting mica product. A somewhat similar percolator, the "146-V," sold separately, is made of highly polished aluminium, fitted with a heat-resisting handle. The fused high-speed element has a loading of 325 W. The "Radiant" curling iron (15-W loading) is available in three colours—green, mauve and blue—and is supplied with non-kinkable flex.

The company is also marketing several new British-made articles. A chromium-plated illuminated shaving mirror measuring 10 in. by 8 in., takes a standard 15- or 25-W lamp and will hang or stand, while a wide range of travelling irons weighing from 1¼ to 3 lb. are attractively finished in chromium plate and blue, have a stout circular flexible and alternative plug connections for 150 V or 250 V. A new 2-pt. kettle (700 W) is of robust construction, chromium plated and fitted with a quick-set safety device. The appliances are illustrated at the foot of this page.

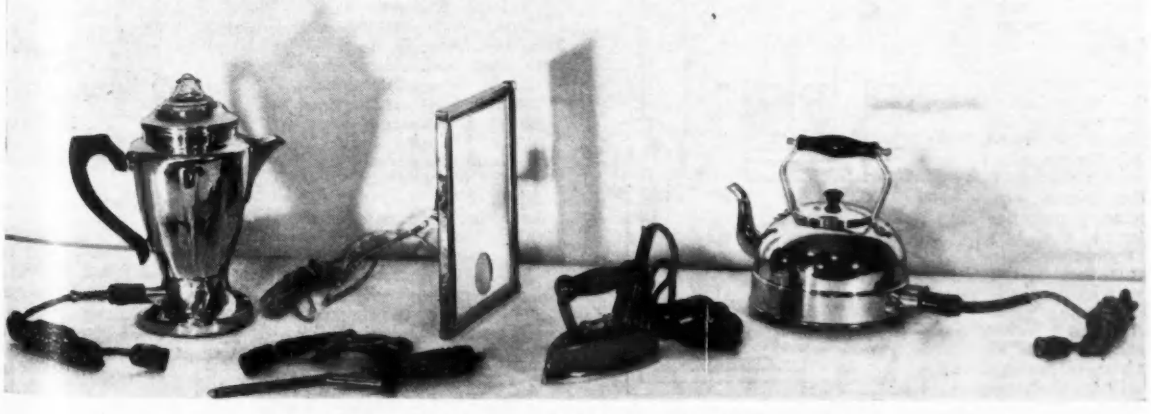
A Condenser Capacity Meter

The latest product of RUNBAKEN ELECTRICAL PRODUCTS, 280, Deansgate, Manchester, 3, is a condenser capacity meter and galvanometer. This is a cheaper and smaller type than the original tester and it reads direct capacities of all types of condensers used in magnetos and ignition systems. It indicates from 0.01 to 0.5 microfarads and the standard type operates on 230 V a.c. only, although other voltages are also catered for.

A condenser capacity meter

"Anka" Connectors

In our issue of October 30th we stated that the combined plug and lampholder adaptor fitted to "Anka" connectors was changed from one form to the other by screwing the adaptor.



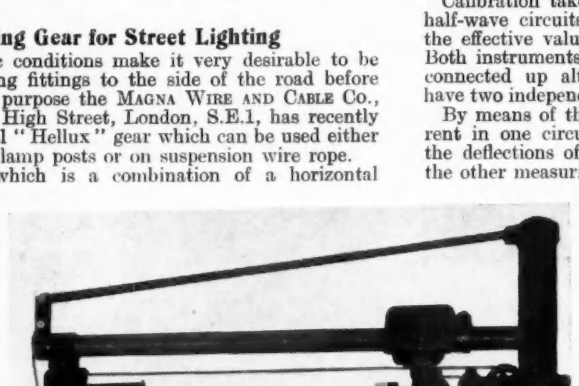
The recently-introduced range of S.L.R. domestic electrical appliances

Callender's Cable & Construction Co., Ltd., informs us that these "Union" adaptors, made by A. P. Lundberg & Sons, Ltd., are converted by pressing in a spring catch and pushing the adaptor into the body of the unit, leaving the two pins projecting.

Traversing Gear for Street Lighting

Present-day traffic conditions make it very desirable to be able to draw lighting fittings to the side of the road before lowering. For this purpose the MAGNA WIRE AND CABLE CO., LTD., 136, Borough High Street, London, S.E.1, has recently brought out a special "Hellux" gear which can be used either on bracket arms of lamp posts or on suspension wire rope.

The new gear, which is a combination of a horizontal coupling and a fitting carriage, can be operated by one man, by a double winch or an ordinary winch with a counterweight arrangement. One part is fixed permanently to the extreme end of the pole arm by means of a bracket. Attached to this are the sockets of the horizontal coupling which are housed under a cast-iron rain guard. The other part of the gear, which acts as a fitting carriage, moves freely on the pole arm by means of rollers. To the bottom part of this carriage the contacts and a pulley block are fixed.



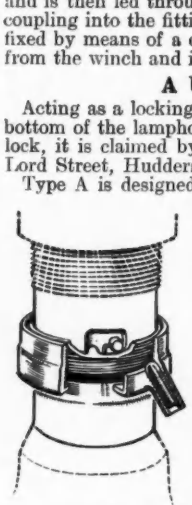
"Hellux" traversing gear with lighting fitting lowered for cleaning and attention

If a counter-weight arrangement is used, a special pole clamp with two pulley wheels is required. The larger of these is fixed partly into the lamp-post and carries a wire rope on one end of which is attached the counter-weight. The other end of the wire is taken to the extreme end of the pole arm where it runs again over a pulley wheel and is then led through the central tube of the horizontal coupling into the fitting carriage. Here it is permanently fixed by means of a cup washer. Another wire rope runs from the winch and is finally fixed in the vertical coupling.

A Universal Lamp-lock

Acting as a locking screw-jack between the lampcap and the bottom of the lampholder, the new "Lox-all" universal lamp-lock, it is claimed by the manufacturers, J. A. BROOK, LTD., Lord Street, Huddersfield, will fit any type of lampholder.

Type A is designed to fit all standard pattern lampholders, brass or bakelite, and type B fits all makes of H.O. lampholders with a protective skirt. The lock also serves to eliminate lamp vibration.

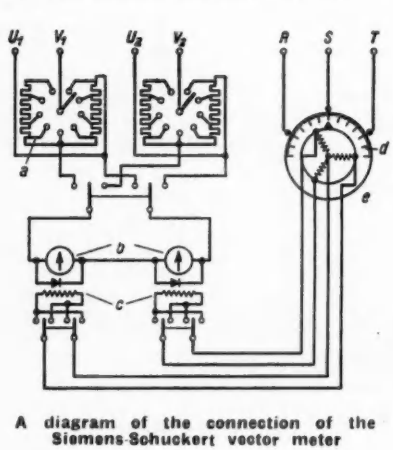


The "Lox-all" lamp-lock

A Vector Meter for Industrial Measurements

A vector meter consisting essentially of two high-sensitivity d.c. instruments, two rectifiers with oscillating contacts, a phase adjustor with angular scale and two range switches, has been developed by Siemens & Halske, and is obtainable from SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., 30-34, New Bridge Street, London, E.C.4. Two current or voltage circuits can be connected simultaneously to the vector meter annd linked in circuit with the instruments alternately. The internal loading of the measuring system is only about 1 mW in the lowest range, although measurements are made on the direct deflection principle.

A three-phase supply is required for the phase adjustor, the rotor of which supplies energy for operating the rectifiers, the exciter windings of the latter being connected to the phases or interlinked voltages in such a way that the phase displacement between the two exciting currents is 90 deg. If the switching phase is made time-coincident with one half-wave of the measuring voltage, the contact switches over this half-wave to the d.c. instrument, which indicates the arithmetic mean of the half-wave. At any arbitrary phase displacement between the switching phase and the measuring voltage, the deflection is proportional to the cosine of the angle of displacement.



A diagram of the connection of the Siemens-Schuckert vector meter

Calibration takes into consideration the form factor and in half-wave circuits the suppression of one half-wave, so that the effective value is indicated in sinusoidal a.c. magnitudes. Both instruments are in circuit at the same time and can be connected up alternately to the measuring circuits, which have two independent potentiometers for extending their range.

By means of the phase adjustor the effective voltage or current in one circuit can serve as the reference vector, when the deflections of the two instruments, on switching over to the other measuring circuit, correspond to the sine and cosine components of the other measured quantity referred to the first vector. The poles of the rectifier exciter windings are changed over separately so that negative half-waves also can be measured in all four quadrants. By adjusting the phase regulator, one of the two instruments can be adjusted to zero in both circuits. The angle of displacement can then be read off directly in degrees on the scale of the phase adjustor. In each range measurements can be made between 0.15 to 150 V and 0.005 to 5 A. The phase adjustor has a range of 360+40 degrees of arc with an accuracy of about 1 deg. A real power of 5 W still gives a deflection of 20 divisions.

The vector meter may be used for plotting the vector diagram of any a.c. load or the internal consumption of instruments, meters, relays, or for measurements on a.c. systems with very small phase angles.

In conjunction with simple auxiliaries the instrument measures the wave form and peak value (particularly in high-voltage tests), by exploring stray fields in the neighbourhood of a.c. cable or apparatus, determining the distribution of flux and induction at iron cores and air gaps, and ascertaining the slip frequency of asynchronous motors and the characteristics of large motors and transformers.

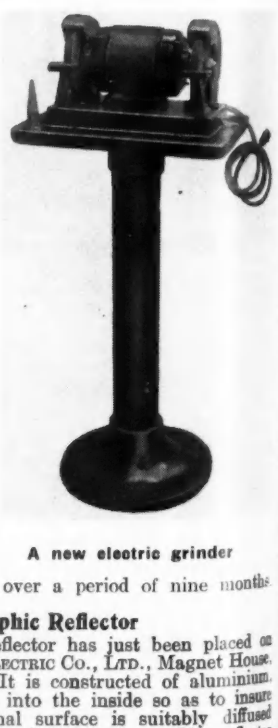
In bridge circuits the vector meter can act as a zero indicator, as separate balancing of the real and imaginary components can be obtained.

Terminal Mounts

A sample terminal mount has been sent to us by BELLING & LEE, LTD., Cambridge Arterial Road, Enfield. It has been redesigned to make it suitable for high voltages (up to 7,000 V) such as are required for television work. Unusually long creepage paths are provided between the terminals, fixing screws, &c.

An Electric Grinder

A ¼-h.p. single-phase motor with a speed of 2,800 r.p.m. is fitted to the new electric grinder which has just been placed on the market by FRY'S (LONDON), LTD., 24-25, King Street, London, E.1. The overall spindle length is 13 in. and the height 9¼ in., a stand bringing it up to 43 in. The standard equipment comprises two adjustable wheel guards, two tool rests, a toggle switch in the base, and two 6-in. by ½-in. grinding wheels, medium and fine.



A new electric grinder

Battery Terminal Oilers

A small accessory made by MESSRS. HOWARD CLAYTON-WRIGHT, Kings Lane, Bishopton, Stratford-on-Avon, is designed to keep accumulator terminals adequately lubricated. This is accomplished by means of a felt washer which encircles the terminals and also dips into an oil reservoir. One filling of the reservoir will keep the terminal lubricated and prevent corrosion over a period of nine months.

A Photographic Reflector

A portable photographic reflector has just been placed on the market by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. It is constructed of aluminium, having a double reflector let into the inside so as to insure greater strength. The internal surface is suitably diffused and the outside has a highly polished surface. The reflector is mounted on a balanced stand, and can be tilted by means of a knuckle joint and wing nut. The lamp used is a 500-W photographic type with internally frosted bulb.

British Overseas Electrical Trade

Exports better than for six years

WHEREAS in recent months machinery exports have been largely responsible for the increase in our overseas electrical trade, in October goods and apparatus shipments contributed the greater stimulus, being of a higher value than in any corresponding month since 1929—some time before the trade depression actually set in. Exports as a whole, at £1,429,968, were £100,359 (8 per cent.) more than in October last year, which contained the same number of working days. Moreover, they were of a higher value than in any month in the past six years. Were it not for the continued weakness of a number of our foreign markets the month's figures would have ranked among those in the most prosperous years of the industry's overseas trade. In assessing the merit of the recent recovery, however, we must bear in mind the effect of rising commodity prices.

The accompanying smaller table, compiled from figures abstracted from the Board of Trade returns for the month, shows how widely distributed were the increases. Radio valves and parts are shown as having decreased; the totals are, however, substantially more than in September, and the same may be said of telephone and telegraph apparatus other than radio, the demand for which, it will be remembered, was exceptionally good about this time last year. Argentina's occupancy of the position of best customer for this type of equipment proved to be short-lived, South Africa assuming first place. Shipments to the former country, nevertheless, continue to be very satisfactory, as the following analysis shows (figures for October, 1935, in parentheses):—

Telegraph and telephone apparatus (other than radio).—South Africa, £37,237 (£36,680); Australia, £29,992 (£47,067); Argentina, £29,838 (£3,745); Canada, £650 (£894); other British countries, £46,208 (£26,605); other foreign countries, £9,024 (£88,077).

Exports of wires and cables (not submarine) were well up on both the previous month and October, 1935. It is noteworthy that foreign countries contributed to the increase in the case of cables other than telephonic and telegraphic, as is indicated in the following analysis of chief destinations (comparative figures for October, 1935, in parentheses):—

Rubber insulated wires and cables.—Australia, £32,002 (£28,906); South Africa, £22,338 (£22,613); British India, £21,123 (£35,833); New Zealand, £10,874 (£5,950); other British countries, £14,979 (£12,239); foreign countries, £14,419 (£8,996).

Electric wires and cables (insulation other than rubber).—Australia, £27,473 (£22,415); British India, £23,383 (£27,211); South Africa, £21,879 (£25,684); other British countries, £28,368 (£12,210); foreign countries, £21,334 (£12,792).

Among other classifications the increase of £25,437 in shipments of accumulators was unusually large, while with an advance of £23,677 unenumerated electrical goods reached a higher level than in at least any month this year. In the machinery section the position was not quite so good, for the total of £387,123 was exceeded in six months of this year. Smaller shipments to South Africa principally accounted for this; the Union, however, continues to be our best customer for electrical equipment as a whole. In the goods section, exports to British Malaya, Hong Kong, New Zealand, Brazil and Argentina were again well above the values in the corresponding month of last year. There was a series of decreases in the case of foreign countries, and, as might be expected, the largest were in respect of Italy and Spain. The falling off of £12,121 in the case of China is more disturbing, for ordinarily our trade is little enough with that country, which should present good openings for our manufacturers.

Imports have lately been increasing rapidly, but in October the rate slowed down. At £451,822 they were £24,092, or 6 per cent. more than in the corresponding month of last year. In contrast with our own exports of such apparatus, imports of radio valves and parts increased in value by £16,755, while there was also a substantial rise in the case of insulated wires and cables (+ £14,227). The chief sources from which electrical equipment was derived, with comparative figures, were as follows:—

Electrical goods and apparatus.—United States, £124,974 (£101,160); Germany, £75,929 (£84,286); Netherlands, £61,034 (£71,390); Belgium, £21,595 (£10,959); Switzerland, £16,494 (£19,417); France, £11,684 (£11,790); Austria, £7,717 (£12,696); other foreign countries, £47,456 (£49,516); British countries, £19,211 (£9,586).

Electric vacuum cleaners.—United States, £10,256 (£5,359); Sweden, £3,449 (£6,166); Germany, £1,771 (£913); Canada, £1,252 (£13,371); other foreign countries, £2,658 (£2,422).

In the ten months to the end of October the total value of electrical exports was £12,114,485 against £11,035,542 in the corresponding period of last year, representing an increase of 9 per cent., while imports were £3,553,140 against £2,972,298, an increase of 19 per cent.

EXPORTS AND IMPORTS DURING OCTOBER

	Exports. Oct., 1936.	Exports. Inc. or dec. compared with Oct., 1935.	Imports. Oct., 1936.	Imports. Inc. or dec. compared with Oct., 1935.
Submarine telegraph and telephone cables	£57	− £11,226	*	—
Telegraph and telephone wires and cables (not submarine)	53,894	+ 22,422	*	—
Other insulated wires and cables	238,172	+ 23,323	£36,925	+ £14,227
Radio receivers, not radiograms (excluding valves)	36,288	+ 245	27,211	− 4,772
Radio transmitters (excluding valves)	31,770	+ 22,286	*	—
Radio valves	55,822	− 1,338	25,993	+ 5,568
Other radio parts and accessories	51,427	− 12,686	101,965	+ 11,187
Telegraph and telephone apparatus (other than radio)	172,949	− 30,089	*	—
Electric carbons	*	—	8,774	+ 363
Incandescent lamps	55,384	+ 2,909	20,856	+ 2,089
Other lighting apparatus	53,422	+ 9,019	59,651	− 4,046
Primary batteries	19,777	+ 1,181	725	+ 44
Accumulators	71,837	+ 25,437	*	—
House service meters	18,742	+ 3,855	*	—
Other electrical instruments	21,387	+ 1,609	22,680	− 6,222
Unenumerated electrical goods and apparatus	161,917	+ 23,677	81,314	− 3,144
Electric generators up to 200 kW	35,602	+ 5,268	*	—
Electric generators over 200 kW	24,807	+ 753	*	—
Electric motors	109,442	+ 16,853	22,490†	+ 891
Convertors and transformers	70,816	+ 2,594	*	—
Starting and controlling gear for motors	29,273	− 7,801	*	—
Switchgear	104,015	+ 7,286	*	—
Other electrical machinery	13,168	− 5,218	23,501	+ 16,350
Electric vacuum cleaners	*	—	19,728	− 8,503
Total	£1,429,968	+ £100,359	£451,822	+ £24,092

* Not classified separately. † Not railway and tramway motors.

BRITISH ELECTRICAL EXPORTS DURING OCTOBER

Destination.	Goods and apparatus, Oct., 1936.	Inc. or dec. compared with Oct., 1935.	Electric generators, Oct., 1936.	Inc. or dec. compared with Oct., 1935.	Electric motors, Oct., 1936.	Inc. or dec. compared with Oct., 1935.	Other electrical machinery, Oct., 1936.	Inc. or dec. compared with Oct., 1935.
Irish Free State	£73,981	+ £12,931	*	—	*	—	*	—
Channel Islands	21,336	+ 3,098	*	—	*	—	*	—
Union of South Africa	180,616	+ 40,375	£6,633	− £8,497	£24,067	− £1,165	£84,003	− £15,817
British India	132,645	− 9,226	7,069	− 301	18,611	− 4,730	37,133	+ 4,387
British Malaya	25,296	+ 10,812	*	—	*	—	6,394	+ 3,406
Ceylon	7,940	+ 2,551	*	—	*	—	*	—
Hong Kong	22,455	+ 17,701	*	—	*	—	*	—
Australia	140,365	− 839	9,811	+ 5,385	11,795	− 548	11,161	+ 178
New Zealand	81,290	+ 35,163	*	—	6,941	+ 2,871	11,528	− 4,428
Canada	11,973	+ 5,013	1,213	+ 568	3,850	− 14	1,504	+ 363
Other British Countries	59,119	+ 7,455	19,831	+ 6,619	13,968	− 4,235	25,338	+ 6,344
Sweden	21,698	− 6,096	*	—	*	—	*	—
Denmark	13,391	+ 4,200	*	—	*	—	*	—
Netherlands	12,150	− 5,756	569	+ 344	*	—	1,193	+ 774
Belgium	16,104	− 1,122	*	—	*	—	*	—
France	17,405	− 6,670	*	—	*	—	1,935	− 163
Portugal	5,333	− 3,239	*	—	*	—	*	—
Spain	1,116	− 19,158	*	—	*	—	*	—
Italy	155	− 12,436	*	—	*	—	*	—
Greece	4,097	+ 1,013	*	—	*	—	*	—
Rumania	4,254	− 7,009	*	—	*	—	*	—
Egypt	11,257	− 2,338	*	—	*	—	1,340	− 294
China	7,685	− 12,121	*	—	*	—	4,061	+ 2,078
Brazil	22,204	+ 15,274	*	—	*	—	*	—
Argentina	53,845	+ 32,482	*	—	1,677	− 466	1,045	+ 230
Soviet Union	*	—	*	—	—	− 24	*	—
Other Foreign Countries	95,135	− 21,434	15,283	+ 1,903	28,533	+ 16,694	30,637	− 197
Total	£1,042,845	+ £80,624	£60,409	+ £6,021	£109,442	− £16,853	£217,272	− £3,139

* Not classified separately.

New Books

Statistical Year Book of the World Power Conference, No. 1—1933 and 1934. Edited by F. BROWN. London: World Power Conference. £1. Pp. 112.

This is the first volume of an annual devoted to the power resources of the world. It contains an estimate of the power potentialities of different countries, and statistics for 1933 and 1934 of the production, stocks, imports, exports and consumption of fuels of various kinds and electricity. Production by different types of electrical plant and consumption for different purposes are shown separately; the statistics of water power are also given in considerable detail. All important sources of power are included, except manufactured gas, which will be included in subsequent issues. Most of the statistics were compiled by the national committees of the World Power Conference and by Government Departments in England and abroad in conformity with standard definitions. Some of the information presented has not been published before in any country.

A Text-Book of Illumination. By W. KUNERTH. (Second edition.) Pp. 276; figs. 112. London: Chapman & Hall, Ltd. Price 15s. net.

This book is stated to have been "designed as a text-book in illumination for undergraduate students," and from the fact that a second edition has been called for in seven years it would appear to have been quite widely adopted for the purpose. It is, therefore, all the more regrettable that the author has left uncorrected the inaccuracies which appeared in the earlier edition. For instance, we still read (p. 173) under the heading "Purkinje effect" the following astonishing statement: "If the light intensity falls much below that intensity [at which the Purkinje effect occurs] the eye again becomes more sensitive to red light and we have what is known as a reversed Purkinje effect."

Other examples, chosen at random, are the erroneous explanation of the Crova wave-length, the description of a "black-body" standard of light which is utterly different from the accepted form, and the decidedly original experiment designed to enable the student to determine Fechner's fraction. On p. 121 "α" is for "transmission co-efficient" and "r" for "reflection factor," although surely in a text-book for use by students, particular care should be taken to adopt internationally agreed nomenclature and symbols.

One of the most useful features of the book is the list of references given at the end of each chapter; these have been extended and brought up to date in the present edition. The chief disadvantage, from the point of view of the reader in this country, is that nearly all the literature cited is American.

The Making and Moulding of Plastics. By L. M. T. BELL. Pp. 238; figs. 51. London: Hutchinson Scientific & Technical Publications. Price 12s. 6d.

This work is intended to provide for all engaged in the plastic mouldings industry an easy means of studying the materials. It discusses the history, present position and possible future developments of the better-known compounds, little attention being paid to substances that seem unlikely to offer much scope in the future. For the benefit of the more technical readers a discussion of processes of resinification and other more advanced information is included. A chapter is devoted to testing, which the author treats from an original angle. More directly electrical aspects are dealt with in the section on heating (one page) and tests (eighteen pages). The obstacles to the greater use of electricity for heating are stated to be cost of energy and maintenance troubles due to leakage from the hydraulic system. For quick heating 10 W per sq. in. of platen area is said to be required, the normal being 5 W.

Handbook of Engineering Fundamentals. Edited by O. W. ESHBACH. Illus London: Chapman & Hall, Ltd. Price 25s.

This volume is the result of the collaboration of forty eminent American authorities on engineering matters, and is an able exposition of the fundamentals of engineering. Laws and theories are outlined and discussed, and a general account is given of the principles of engineering technique and of contractual relations.

The volume is divided into thirteen principal sections. The first three are devoted to mathematical tables and physical standards, the chapters dealing with dimension systems having been written in an exceptionally clear style. As a basis for model experiments, dimensional analysis is extremely valuable. Sections four to seven deal with the mechanics of materials and fluids and engineering thermodynamics. The basic principles involved are given prominence and show how means have been developed for determining the nature and amounts of the energy transformations occurring in engineering processes. The remaining sections of the volume deal with electricity and magnetism, radiation, acoustics, metallic and non-metallic materials. A clear presentation is given of the principles of magnetic circuits.

The definitions given throughout the text are those recommended by the Sectional Committee on Electrical Definitions of the A.I.E.E. In considering the theory of radiation, the subject is discussed in its widest aspects and it is shown that certain phenomena can be explained only if a wave nature of radiation is assumed. A table is given showing the completely closed range of electro-magnetic radiations from longest to shortest wave-lengths with the supposed sources of radiation. A chapter of especial interest deals with the physiology of radiation, in which are discussed spectral visibility, the theories of colour vision and the analysis of colour. The physiological action of infra-red, ultra-violet and X-radiation are also considered.

The volume is a valuable contribution to current engineering literature and should appeal to the student and practical engineer. Great care appears to have been taken to ensure the accuracy of the data recorded.

The Electrical Handicraftsman and Experimenters' Manual. By H. R. LANGMAN and J. H. MOORE. Pp. 192; figs. London: Technical Press, Ltd. Price 7s. 6d. net.

The teaching of elementary science in schools has resulted in the arousing of a more general interest in contrivances of a mechanical or electrical character, such as those considered in this volume. The earlier chapters are devoted to descriptions of useful electrical devices and components, with some account of ingenious and elegant machines devised for converting electrical into mechanical energy. In the latter chapters of this book the authors discuss how inventive and creative ability may be stimulated.

One chapter of exceptional interest deals with the manufacture of electro-magnets, solenoids and armatures, and includes a study of magnetic leakage and winding machines. In others general accounts are given of special models for elucidating the basic principles and constructional features of dynamo-electric machines, with illustrated descriptions of experimental electrical apparatus (including generators incorporating double and triple principles for the generation of current), machines for the conversion of d.c. into a.c., and the construction of a novel eight-electrode adjustable spark plug.

The final chapters comprise studies of diagram models specially designed for the exposition of physical phenomena, together with practical devices which are of universal interest. Among these models are some that illustrate the physical changes occurring in a condenser or storage battery during the charging and discharging processes, special contact devices for electrical release of clockwork, and suggestions for the construction of bearings of electrical apparatus.

This volume will appeal to the amateur experimenter as it has been written in non-technical language, while the drawings have been prepared wherever possible in pictorial style.

The Handbook of Chemistry and Physics. Edited by C. D. HODGMAN. (21st edition.) Pp. 2028. Cleveland: Chemical Rubber Publishing Co. Price $6 net.

This handbook of data relating to the twin sciences of chemistry and physics first appeared in 1914, and it has grown steadily in size and importance ever since. The present edition contains 64 more pages than the previous one, while 175 pages have been completely revised. The mathematical section, the collection of laboratory recipes, the photographic section and the table of isotopes have been revised, enlarged and brought up to date, while a new section has been included on commercial plastics.

It is divided into five sections classified as mathematical tables; properties and physical constants; general chemical tables; heat, hygrometry, sound, electricity and light; quantities and units—miscellaneous tables. These contain the following:—four pages on antidotes for poison and treatments for burns and scalds and fire precautions; 302 pages of mathematical tables and formulæ; 741 pages of chemical tables; 197 pages on the properties of matter; 154 pages on heat; 20 pages of hygrometric and barometric tables; seven pages on sound; 108 pages on electricity and magnetism; 141 pages on light; and 195 pages of miscellaneous tables.

The handbook is a mine of information and an invaluable book of reference for chemists and physicists and those associated in any way with these sciences.

Shorter Notices

"How to Buy Timber," by R. R. Rivers (Sir I. Pitman & Sons, 3s. 6d.), sets forward in simple language such information as will be of assistance to all who require timber. In its sixteen chapters all varieties of wood are dealt with, including plywood, and mention is made of the right type of timber to select for wireless poles and refrigerators.

"Everyday Science," by A. W. Haslett. Pp. 354. London: G. Bell & Sons, Ltd. Price 7s. 6d. net.

"Accumulator Charging, Maintenance and Repair," by W. S. Ibbetson. (Fifth edition). Pp. 151; figs. 41. Price 3s. 6d. net. "The Performance and Design of Alternating Current Machines," by M. G. Say and E. N. Pink. Pp. 552; figs. 378. Price 20s. net. "The Alternating Current Circuit," by P. Kemp. (Second edition.) Pp. 104; figs. 57. Price 2s. 6d. net. London: Sir Isaac Pitman & Sons, Ltd.

"Die Wechselstromtechnik—Band 2 'Die Transformatoren'," by I. L. la Cour and K. Faye-Hansen. Pp. 699; figs. 535. Berlin: Julius Springer. Price: Rm. 48.

"Public Utility Industries," by G. Lloyd Wilson, J. M. Herring, and R. B. Eutsler. Pp. 412; figs. 13. London: McGraw Hill Publishing Co. Price 21s.

In the Courts

Prison for Theft of Electricity

At the South Shields Police Court last week thirteen men were summoned for the fraudulent abstraction of electricity from the Corporation's mains. The solicitor for the prosecution said that in each case a wire had been used to bridge the meter and prevent it registering the consumption. There had been a serious increase in the number of such cases, and the resources of the department were being severely strained in tracking them down.

Replying to one of the defendants, who suggested that the meters supplied should not be accessible, the prosecutor said that covers were provided where these offences were discovered, but to put covers on all the meters in use would cost £25,000.

In giving their decisions the magistrates pointed out that the defendants were liable to a fine of £100 with an alternative of six months' imprisonment. Two of the defendants who had previous convictions were sent to prison for a month and fines ranging from 10s. to 25s. were imposed on the others.

At another sitting of the Court six women were charged with the same offence and were fined sums ranging from 5s. to 30s.

Damages for Film Actress

In the King's Bench Division on November 16th Mr. Justice Porter delivered his reserved judgment in the action brought by Mrs. Florence Russell, a film actress (professionally known as Peggy Crawford) against Criterion Film Productions, Ltd., and Mr. Gunther Kampf to recover damages for personal injuries which she alleged she sustained during the filming of "The Amateur Gentleman." The defendants denied liability, alleging that the lighting was normal for a film studio.

The case was reported in the ELECTRICAL REVIEW of November 6th.

His Lordship, in the course of his judgment, said that he did not find that the lights were kept on unreasonably long in the filming of the scene or that the defendants were negligent in that respect. He accepted the plaintiff's evidence that she had sustained severe burns in her eyes although he thought that her story as to the extent of her injury was exaggerated. He accepted the defendants' evidence that the lighting, though brilliant, was not brighter than at times used in ball-room scenes and he found that it was not of supranormal power and intensity and was produced by the usual equipment for that class of scene.

The defendants knew the dangers of the lighting and its possible effects on the eyes, and he found as a fact that the plaintiff did not know that any risk of what was called "Kleig-eye" existed and undoubtedly the injury which she suffered was due to the system which the defendant company adopted to obtain a good picture. He also found that the defendant company did not employ Mr. Kampf to regulate or control lighting so as to ensure the safety of the performers or that the control of the lights was left in his hands, and he accordingly held that there had been no negligence by him.

His Lordship, in these circumstances, entered judgment for the plaintiff against the film company for £126 19s., with costs, and for Mr. Kampf whose costs his Lordship ordered should be added to those payable by the defendant company.

Claim Against Irish Electricity Board

A settlement was announced in the High Court, Dublin, recently, before Mr. Justice Hanna, in an action in which Mrs. Annie Tobin, Limerick, claimed damages against the Electricity Supply Board for personal injuries received as a result of the negligence of the Board's workmen in leaving open a manhole in Shannon Street, Limerick, while they were laying a subterranean cable on January 25th. She stated that when walking along the street she fell into the opening, which was not properly guarded, and suffered severe injuries.

The settlement provided for the payment of £250 and costs to Mrs. Tobin.

Parliamentary News (BY OUR SPECIAL REPORTER)

Guarding Live Electric Rails

IN the House of Commons on November 11th Wing-Commander James asked the Minister of Transport whether, in view of the danger to human and animal life, he would take steps to ensure that all live electric rails were adequately protected upon railway systems in open country.

Mr. Hore-Belisha said he was advised that live electric lines were protected where persons and animals were allowed on the line.

Television Costs

On November 12th Sir P. Latham asked the Postmaster-General if he would state the estimated capital cost of television to date on research and on provision of existing plant, respectively; the estimated annual expenditure on the upkeep of the plant, salaries, and artistes' fees; and the estimated number of television receivers in use and the basis on which the estimate was compiled.

Major Tryon said that the cost of television research had been borne by the commercial firms engaged in the manufacture of equipment. The plant acquired by the British Broadcasting Corporation up to the end of October, 1936, cost approximately £110,000. The public service, which was at present of a restricted character, had only been in operation since November 2nd, and it was not yet possible to form a reliable estimate of annual expenditure. No information was available concerning the number of television receiving sets at present in use; but the Television Advisory Committee had recently approached the Radio Manufacturers' Association with the object of securing, from time to time, confidential information concerning the total number of sets sold by members of the Association.

Electricity Distribution

Colonel Heneage asked the Minister of Transport whether, having regard to the new proposals contained in the Report of the Committee on Electricity Distribution, dated May 8th, 1936, he was now prepared to publish the evidence given before the Committee.

Mr. Hore-Belisha said that evidence was taken by the Committee on the understanding that it would be regarded as confidential.

Chilean Electrical Imports

FEATURES of the electrical import trade of Chile last year were a continuation of the revival of demand, a further small increase in the share of the United Kingdom, and a much larger increase in that of Germany. The more noteworthy increases were in telephone and wireless material, motors and cables. Much of the demand last year was connected with the development of manufacturing industries, but this movement seems likely to be checked. For the purpose of the foreign trade returns the Chilean peso is valued at 6d. In the following table the values of the principal groups of electrical imports in 1935 are given, together with a note of increases or decreases compared with 1934.

	1935 Pesos (000).	Inc. or dec. on 1934 Pesos (000).
Lamps—		
Total	1,270	+ 10
From Germany	641	+ 336
„ United States	440	— 110
„ Holland	39	— 18
„ United Kingdom	39	+ 26
„ Japan	53	— 142
Wireless valves and earphones—		
Total	260	— 26
From United States	182	+ 12
„ United Kingdom	3	— 9
„ Holland	22	— 60
Telephone apparatus—		
Total	760	+ 510
From United States	170	+ 104
„ United Kingdom	410	+ 368
Telegraph apparatus—		
Total	103	+ 38
From United Kingdom	80	+ 73
„ Germany	7	— 48
Radio apparatus—		
Total	2,598	+ 265
From United States	2,162	— 81
„ United Kingdom	62	+ 57
Turbines—		
Total	164	+ 146
Motors—		
Total	870	+ 455
From Germany	368	+ 248
„ United States	358	+ 162
„ France	2	— 25
„ United Kingdom	7	—
„ Sweden	82	+ 50
Insulators—		
Total	125	+ 56
From Germany	18	+ 10
„ United States	100	+ 44
„ Great Britain	7	+ 2
Cables and insulated wire—		
Total	1,960	+ 1,340
From Germany	710	+ 578
„ Belgium	42	+ 30
„ United States	880	+ 600
„ United Kingdom	290	+ 113
Carbons and electrodes—		
Total	361	— 7
From United States	288	— 48
Dynamos, alternators, convertors and unspecified electrical machinery—		
Total	153	+ 1
From Germany	68	+ 45
„ United Kingdom	24	— 48
„ Sweden	14	+ 7
„ United States	35	— 5
Transformers—		
Total	270	— 7
From Germany	74	+ 4
„ United States	116	— 37
„ United Kingdom	47	+ 22
Resistances—		
Total	70	—
From United States	48	— 1
„ Germany	5	— 1
Unspecified electrical apparatus—		
Total	434	+ 180
From Germany	81	— 87
„ United States	273	+ 222
„ United Kingdom	65	+ 55
Current meters—		
Total	320	+ 56
From United States	207	—
„ Switzerland	8	+ 5
Batteries—		
Total	189	— 25
From Germany	12	— 3
„ Denmark	25	+ 7
„ United States	126	— 19
„ United Kingdom	12	— 8
Accumulators—		
Total	980	+ 54
From United States	686	+ 21
„ Canada	18	+ 10
„ United Kingdom	39	— 39

Business and Industrial Notes

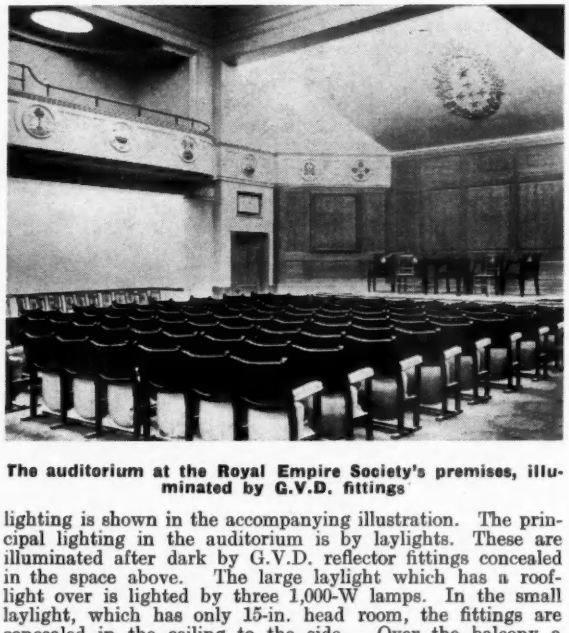
The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

British Industries Fair

It was intended to house the textile and furniture sections of the 1937 British Industries Fair in the new Earl's Court buildings. Owing to unforeseen circumstances, however, it has now been decided to keep these sections at Olympia next year. In any event any London exhibits of an electrical character would have been housed at Olympia so that the decision does not affect this arrangement. The Castle Bromwich plans are, of course, in no way affected.

An Architectural Lighting Installation

Some very interesting architectural lighting by G.V.D. Illuminators, Ltd., can be seen at the new Royal Empire Society Building. The installation is particularly impressive in the assembly hall in the basement. Here the stage is illuminated by only ten lamps mounted in a cornice behind the proscenium arch. The evenness and effectiveness of this



The auditorium at the Royal Empire Society's premises, illuminated by G.V.D. fittings

lighting is shown in the accompanying illustration. The principal lighting in the auditorium is by laylights. These are illuminated after dark by G.V.D. reflector fittings concealed in the space above. The large laylight which has a rooflight over is lighted by three 1,000-W lamps. In the small laylight, which has only 15-in. head room, the fittings are concealed in the ceiling to the side. Over the balcony a circular cove in the ceiling is lighted with six 40-W lamps. Cornice lighting is also effectively used in the east and west aisles under the balconies. Owing to ventilating ducts occupying the necessary space on the outside walls, lighting could only be done from the inner sides of these aisles. In the buffet the main lighting is indirect from a circular cove in the centre of the ceiling. Seventeen 60-W lamps are used.

Commercial Cooking Conference

A conference of representatives of supply authorities in the Mid-East England Area was organised by E.D.A. and held at the Leeds electricity works on November 11th. Mr. W. E. Swale (Manchester) gave reasons why large-scale cooking and baking formed a desirable load for supply authorities, and urged the necessity for all authorities to provide suitable low tariffs. He spoke of the large-scale installations in Mid-East England and outlined the field for further development, as well as indicating the obstacles to be overcome. The stage reached in the progress of commercial cooking installations in various countries, in addition to particulars of local tariffs already in force, and other valuable data, were set out in the comprehensive tables distributed to the members of the audience. Mr. E. M. Ackery (E.D.A.) spoke of the steps being taken by E.D.A. to encourage the development of the commercial cooking load, and gave details of the present position in different parts of the country. He appealed to those present to supply E.D.A. with any information of local installations. Mr. N. McLean, chairman of the Area Committee, presided.

Small Electricity Undertakings' Move

A meeting of the representative committee recently set up by electricity supply undertakings with an annual output under 10 million kWh has been held at Newcastle-under-Lyme. It has been decided to divide the country into twelve regions, following as closely as possible the areas of the Whitley Councils for the industry; to ask an electrical engineer of one of the smaller undertakings in each region to be responsible for the convening of a provisional meeting in his region; and to ask each region to appoint two representatives to a central body. It has been decided to call the body the Association of Smaller Electricity Supply Undertakings, and to ask the Electricity Commissioners to set out clearly the defects which they think exist at present in the distribution side of the industry and the standard which they think should be attained. Mr. A. J. C. De Renzi (Newcastle-under-Lyme electrical engineer), who was appointed hon. secretary *pro tem.* of the Association, was instructed to obtain the necessary signatures of at least twenty members of the Incorporated Municipal Electrical Association to demand the calling of an extraordinary general meeting of the Association at an early date to discuss the McGowan Report and the evidence given by the Association before the McGowan Committee.

New Irish Radio Factory

The new radio and gramophone factory erected by Electrical and Musical Industries (Ireland), Ltd., at Waterford, has now commenced production. It is an imposing modern structure, the lighting and general lay-out of its spacious interior being noteworthy. In the coil-winding department eight machines of the latest pattern and of three different types have been installed for the manufacture of various classes of radio coils. Next comes the testing plant. By means of a flash-tester, 2,000 V is passed between the different windings to ensure that they come up to the most exacting requirements. A considerable section of the factory has been set aside for the manufacture of gramophone records, but at present activities are confined to the "pressing" of existing recordings. There is a special system of air conditioning, and there is also a central heating plant. Comfortable canteens are provided for the workers.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for Registration were accepted :—

J. Browne & Co., Pendleton, Salford, 6.
Dawler Radio Stores, Seedley, Salford, 6.
Sidney Southwell, Longsight, Manchester.
J. T. Leach & Co., Upminster.
Milarick & Martin, West Croydon.
D. L. Topps, Ltd., Irlam, Nr. Manchester.
E. Caton & Son, Lancaster.
Leonard A. Evans, Weston-super-Mare.
Fullick & Loosley, Ltd., 28, Uxbridge Road, W.5.

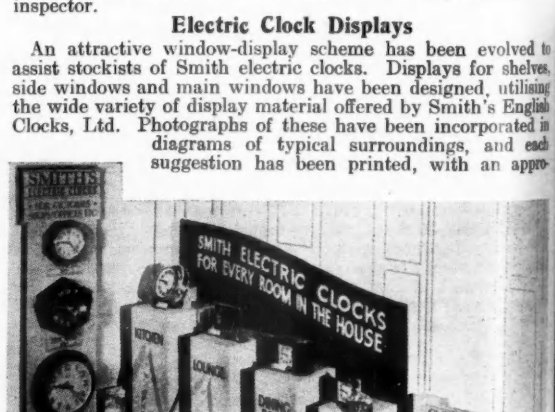
At the same meeting one application was withdrawn and seven were declined.

Bridgend Inquiry

As a sequel to a recent libel case, in which the name of the Bridgend electrical engineer, Mr. W. Welbury, was mentioned, a Ministry of Health inquiry into the matters raised is to be held on December 3rd by Mr. H. Lawson Murphy, K.C., assisted by Mr. A. N. East, an Electricity Commission inspector.

Electric Clock Displays

An attractive window-display scheme has been evolved to assist stockists of Smith electric clocks. Displays for shelves, side windows and main windows have been designed, utilising the wide variety of display material offered by Smith's English Clocks, Ltd. Photographs of these have been incorporated in diagrams of typical surroundings, and each suggestion has been printed, with an appro-



One of the electric clock displays offered by Smith's English Clocks, Ltd.

priate blue print, showing the proportions of all the units with which the display was built. A wallet containing a sheaf of display suggestions is being offered to retailers, who can obtain free material from the company.

New Solder Plant

Production has now been commenced at the new solder plant of Fry's Metal Foundries, Ltd., Merton Abbey, S.W.19, the producers of printing metals, white-bearing metals, aluminium and non-ferrous alloys. Production is controlled by the labora-

tory, which employs fifteen metallurgical chemists. Samples from each pot of solder are carefully analysed and tested here before the metal is released to stores. Pots and methods of pouring are of the firm's own design. As a result of researches during the past three years the company has produced modern solders for aluminium work, spray-gun and body patching, dipping or pot work, low-melting point fusible and high-melting point alloys and a number of non-acid soldering fluxes to a different specification from others on the English market.

Crabtrees of Walsall

A charming brochure has been issued by Messrs. J. A. Crabtree & Co., Ltd., of Lincoln Works, Walsall. It tells attractively by pen and picture of the formation of this great electrical accessories and switchgear business less than twenty years ago by Mr. Crabtree, who died just as he was in the midst of his success last year. He and those associated with him had developed a modernly planned and equipped undertaking with a world-wide reputation, which continues to be carried on with the originality, enterprise and energy which were amongst his characteristics. The interesting story is told very effectively, and the services of the photographer and the artist have been freely utilised to convey the impression that, however great the past may have been, the best is certainly yet to be in the new age of electricity. Among the concluding passages is a statement to the effect that Crabtrees do not share the view that the increasing standardisation of accessories and gear indicates a wider measure of design stability. "We see in much of this activity a danger that real progress may be stultified. We progress, in fact, only when we recognise that to-day's best will be merely just good enough for to-morrow."

A Belgian Lighting Campaign

What is stated to be the biggest effort so far made in Belgium to improve the standard of lighting in that country commenced on November 7th with the opening of "La Quinzaine de la Lumière," which will continue until November 22nd. The event, which has received Government patronage and has been organised by a Committee presided over by M. E. Uytbork, comprises an exhibition of lighting fittings and systems at the Palais d'Egmont, Brussels, and the illumination of the principal monuments in that city, daily addresses to school-children on the subject of lighting, and special lectures to electricians, architects, shopkeepers, &c.

"The Good Companions"

The Metropolitan-Vickers Amateur Dramatic Society presented "The Good Companions" for five nights last week at the Metrovick Club Theatre. The boldness of the venture was fully justified by the results; the handling of the very large cast by the producer, Mr. Harry Matthias, showed experience, and the stage work, under the direction of Mr. R. R. Maddock, was marked by an imagination and efficiency deserving of high praise. The acting also reached a high level, and all the ninety people or so directly concerned with the production worked with an enthusiasm which proved that the show was well named in more than one sense.

Electricity Supply Rifle League

The annual dinner and presentation of prizes in connection with the Electricity Supply Rifle League was held on November 14th in the Lysbeth Hall, Soho Square, under the chairmanship of its president, Mr. W. Weekes, borough electrical engineer of Shoreditch, supported by past presidents: Messrs. H. P. Gaze (London Power Co.) and J. R. J. Bowden (Hackney). There were also present in their capacity of vice-presidents Messrs. E. A. Mills, borough electrical engineer, Hackney; M. Farrer, Twickenham; R. H. Mace, St. James' and Pall Mall Co.; and P. C. Ebner, Shoreditch. About eighty partook of dinner, which was followed by light entertainment. During the course of the evening the hon. secretary, Mr. E. Mathews, gave a brief resumé of the year's events, and as this was the silver jubilee year of the League he touched upon some of the events of the past twenty-five years during which he had been doing the secretarial work. The toast of the president was proposed by Mr. Bowden, to which Mr. Weekes replied.

Advertising Electricity in Singapore

The Singapore Municipality has recently come to the front in advertising electricity. In connection with this campaign

A hand-painted hoarding in Singapore

use is made of hand-painted hoardings, for this method of advertising is extremely popular in Singapore. Designs are prepared in miniature in the art studios, and these are copied on to the hoardings by outdoor artists. The accompanying illustration shows one of the designs executed entirely by hand.

Electricity and Public Health

The extent to which electricity is responsible for the improving conditions of living is brought home strongly by a visit to the Public Health Congress and Exhibition which is being held this week at the Royal Agricultural Hall, Islington, London. In addition to films dealing with heating and acoustics research, the Department of Scientific and Industrial Research has a number of interesting exhibits dealing with atmospheric pollution, X-rays, noise reduction, illumination requirements, ventilation and problems in handling and storing foodstuffs. Several manufacturers have co-operated in displaying equipment similar to that installed in the new Runwell Hospital and they include the British Thermostat Co., Ltd. (heat control apparatus), Falk, Stadelmann & Co., Ltd. (lighting fittings), Standard Telephones & Cables, Ltd. (internal telephones), Wandsworth Electrical Mfg. Co., Ltd. (electrical fittings), and Jackson Electric Stove Co., Ltd., who are supplying the whole of the electric cooking equipment and nineteen food trolleys having a total loading of over 800 kW. The last-mentioned company also has a separate stand on which it is showing typical examples of large cooking equipment for hospitals, hotels, restaurants, clubs, canteens, &c. Electric food trolleys of various types, bread buttering and slicing machines, and potato peelers, are also to be seen on the stand of the Avamore Engineering Co., Ltd., while included among Mabbott & Co.'s exhibits are a combined hotplate and hot closet and potato-peeling machines capable of dealing with 6 to 60 lb. per minute. Summerling & Co., Ltd., Parker, Winder & Achurch, Ltd., and Aveling-Barford, Ltd., are all displaying special electrical equipment for hospital use, and the Paterson Engineering Co., Ltd., is exhibiting a complete ozone plant for sterilising water supplies, either for drinking or for swimming baths. Hanovia, Ltd., which has

A scene from "The Good Companions" played last week by the "Met.-Vick." Amateur Dramatic and Operatic Society

just supplied sixty-four of its lamps for use in the new Bermondsey Public Health Centre, is demonstrating its latest forms of actinotherapy equipment, including the "Alpine Sun" lamp, the "Duo-therapy" unit, and the "Super Kromayer" lamp. Modern methods of collecting and treating refuse and sewage are doing much to combat disease. Specimens of sewage purification plant are shown by Ames Crosta Mills & Co., Ltd., Tuke & Bell, Ltd., and William E. Farrer, Ltd., while James Beresford & Son, Ltd., have on view a range of electrically operated "Beresford-Stork" patent centrifugal self-priming pumps. Special equipment for measuring the colour of potable waters, sewage effluents, &c., is available from Tintometer, Ltd., and recording and measuring instruments of all kinds are manufactured by the Lea Recorder Co., Ltd., and George Kent, Ltd. Electric refuse collecting vans are shown by Electricars, Ltd., and Electric Vans, Ltd., and the latter company is also introducing a 4-cwt. electric hand barrow doing ten miles per charge and available for bakers, milkmen, &c., as well as for dust collection. A comprehensive range of telephone signalling apparatus is shown by Broadcast Distributors, Ltd., while Film Industries, Ltd., and Kalee, Ltd., include cinematograph equipment among their exhibits.

Social Events

We think that the many people present at the Henletel (W. T. Henley's Telegraph Works Co., Ltd.) Swimming Club's seventh annual gala, held at the Holborn Baths on Friday evening last, November 13th, will agree with us that this year's events again provided an excellent evening's entertainment. The competitors were in fine trim, and the races were keenly contested and kept well to schedule. Mr. A. Brewer (hon. secretary of the club) was the winner of

Mrs. Lamont presenting the prizes at the Henletel swimming gala

the men's 100 yd. club championship. In the Henley team races the Gravesend ladies were successful in winning the challenge cup presented by Mr. P. Rosling, while the men from Gravesend won the challenge cup presented by the late Sir George Sutton. Three events of the City Livery Cup were also decided, Gravesend again leading the field. Comedy was provided by Mr. De Beer and his two pupils with some burlesque diving, while Mr. W. C. Bradburn gave an exhibition of log rolling. A water polo match between Henley's (Gravesend) and Holborn S.C. proved exciting, the latter winning by six goals to one. Among those present were Sir Montague Hughman (chairman of the company), Mr. W. F. Bishop (director), Mr. J. Lamont (director) and Mrs. Lamont, and Mr. A. H. M. Jacob (secretary of the company). Mrs. Lamont distributed the prizes.

A pleasant informal evening was spent by the old members of the staffs of the St. James' and Pall Mall Electric Light Co., Ltd., and the Central Electric Supply Co., Ltd., many of whom are now connected with the London Power Co., Ltd., and the London Associated Electricity Undertakings, Ltd., when they dined together on November 7th at Grosvenor House, Park Lane. A large number assembled, Mr. H. P. Gaze, in the absence of Mr. C. P. Sparks, presiding. The date chosen for the function coincided with the eightieth birthday of Mr. F. J. Walker, whose association with the St. James' Company began in 1891 and subsequently continued as managing director until 1935. Ill health prevented him from being present as principal guest.

The annual dinner and dance of Collins Electrical, Ltd., was held at the Strand Corner House on November 14th. Mr. A. P. Boden proposed "The Firm," Mr. C. F. Elwell responding. In proposing "Our Friends," Mr. C. E. Collins said that the "teething" period of Stamford Electrical, Ltd., had now passed and that this associate firm was making definite headway. Response was by Mr. Thorne, jnr., supported by Mr. H. W. Healy. Further speeches were made by Mr. W. F. Billett, Miss M. Pannell and Mr. J. B. Thomson.

Import Duty on Coronation Goods

The Treasury announces that, on the recommendation of the Import Duties Advisory Committee, it has issued orders providing for a temporary total duty of 100 per cent. *ad valorem* during the period December 15th to July 31st, on articles of all kinds suitable for use for or in connection with the celebration of the Coronation of His Majesty or as souvenirs thereof. The French and German Governments have agreed to waive their rights under the trade agreements, provided that a suitable interval elapses between the date of the order and the date on which it comes into operation. The Government has accordingly decided that the temporary duties shall take effect on December 15th instead of December 1st as recommended by the Committee.

The "Northmet" Calendar

The 1937 calendar which the North-Metropolitan Electric Power Supply Co. is issuing to its consumers has monthly sheets, each of which contains a handsomely reproduced photographic study of some of the beauty spots in the rural districts served by the company. Behind the sheet for December there is a three-year calendar. The company has also issued a broad-sheet suggesting electrical Christmas gifts.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable Making Industry announces that there will be no "cost of living" alteration in wages paid on the third pay-day in December.

Trade Announcements

Owing to the continued expansion of business, Rotunda, Ltd., of Denton, Manchester, has taken offices and more commodious storage accommodation at Abbey House, Victoria Street, S.W.1 (telephone: Abbey 4012).

The Premier Radiator and Engineering Co., Ltd., has appointed Alexander Fraser & Co., 132, Renfrew Street, Glasgow, C.2, as its representatives in Scotland.

The Sifam Electrical Instrument Co., Ltd., has been reappointed agent for this country and the Colonies for time switches, both automatic and hand wound, relays and thermostats, manufactured by S.A.I.A., of Berne.

Simmonds & Stokes, Ltd., have removed their head office to Victoria House, Southampton Row, W.C.1 (telephone: Holborn 8637).

In three years the Euston Manufacturing Co., Ltd., has outgrown its accommodation in Euston Road, N.W., and it is therefore removing this week to a new and larger factory and offices at 56, 58 and 60, Grove Road, Walthamstow, E.17 (telephone: Walthamstow 4333/4). The company is negotiating for showrooms in the West End.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. November 18th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£213	£19 inc.
Grade II... ... ... ,,	£147	£12 inc.
Grade III ... ... ,,	£76	£4 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	8d.	—
c ,, Tubes (solid drawn) ... ... ,,	10¼d. to 10⅞d.	—
c ,, Wire, basis ... ... ,,	8⅝d.	—
c Copper Tubes (solid-drawn)... ... ,,	11⅛d.	—
g ,, Bars (best selected)... ... per ton	£75	£1 dec.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£48 5s.	15s. inc.
d ,, ,, Wire Rods ... ... ,,	£54 5s.	15s. inc.
d ,, ,, H.C. Wire ... per lb.	8 $\frac{1}{16}$d.	¼d. inc.
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire Nos. 1 to 12 ... ,,	2 2	3d. dec.
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	11¼d.	¼d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£23	£1 inc.
g Mercury ... ... per bot.	£14 5s.	2/6 inc.
e Mica (in original cases) small ... per lb.	9d. to 1/6	—
e ,, ,, ,, medium ... ,,	5/- to 10/-	—
e ,, ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	1/0¼d.	¼d.
p ,, ,, rolled strip & sheet ,,	1/-	¼d.
p ,, ,, wire ... ... ,,	1/1¼d.	¼d. inc.
o Platinum ... ... per oz.	£9 15s.	—
d Silicium Bronze Wire ... ... per lb.	8 $\frac{16}{16}$d.	¼d. inc.
g Spelter... ... ... per ton	£15 15s.	18s. dec.
r Steel, Magnet, in bars ... ... per lb.	7¼d.	—
g Tin, Block (English) ... ... per ton	£231 10s.	£19 10s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/11	3d. inc.

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Sheffield Plant Contracts

A point of considerable importance to manufacturers of electrical plant and apparatus and to traders arose at a recent meeting of Sheffield City Council. It was whether the Corporation, or the Electricity Committee on its behalf, acted within its rights in negotiating a special price with a specific firm for the purchase of electrical plant, and, subject to City Council approval, agreeing to place an order therefor with the firm, in contradistinction to the long-standing practice of inviting tenders in the open market.

The Electricity Committee asked the Council to direct (a) that it should be relieved from complying with the provisions of Standing Orders 53 (b) and (c) when purchasing and installing a 50,000-kW turbo-alternator set for the Blackburn Meadows Generating Station No. 2, and (b) that it should be relieved from complying with the provision of Standing Order 53 (d) when purchasing switchgear for the rearrangement, modernising and extension of the 11-kV switchgear at the Neepsend generating station. In answer to a series of questions the Chairman of the Electricity Committee, Alderman J. A. Longden, said for some time they had been in the hands of a ring with regard to prices. Not only had they been affected financially but they had been affected detrimentally by plant which had been forced on them. They wished the Standing Orders to be set aside so that they might have power to negotiate instead of advertising in the usual way. A provisional order had been placed without any obligation on the Council or the Committee. The reason for placing it was that they would save a rise of 7½ per cent. in prices which took place on November 2nd. That saving, on a conservative basis, would be about £32,000. Next month, when they came forward with a recommendation to place the order, the actual amount would be stated, and it could be subjected to criticism. The Town Clerk (Mr. E. B. Gibson) ruled that no legal order had been given. There was a provisional order, but the Council was not committed in any way, nor could it be committed until the report of the Finance Consultative Committee was before it. If the Council confirmed the minutes the Committee would be in a position to negotiate during the ensuing month. If it came to a settlement its minutes would recommend the acceptance of the tender or tenders. The Standing Orders, therefore, had not been contravened. Councillor R. Neill said he had before him six recently accepted tenders, which were all more than was being asked of Sheffield. He also had the price which would have been asked if the matter had gone through the usual course of advertising and there was a difference of nearly £30,000. He thought the Committee had negotiated very well indeed. Altogether there would be a saving of about £37,000. The Committee's minutes were adopted.

Ipswich Electrical Ball

The Ipswich and District Electrical Association is holding its second annual ball on December 4th. Tickets (single 5s., double 9s.) may be obtained from the hon. secretary of the I.D.E.A. Social Committee, Mr. B. C. Bullard, Museum Rooms, Museum Street.

The Trend of Modern Lighting

An exhibition showing the trend of modern lighting is being organised by the Science Museum, South Kensington, under the supervision of Mr. W. T. O'Dea, and it will be opened on December 15th by Mr. Hore Belisha, supported by Lord Rutherford and Mr. H. T. Young. The exhibition will include some of the earlier forms of illumination, and E.L.M.A. is collaborating in the display.

A Large Fullagar Engine

In describing in our last issue the 3,500-b.h.p. Fullagar engine which the English Electric Co. is supplying to Bermuda we gave its speed as 2,000 r.p.m.; actually it is only 200 r.p.m.

New Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A 132-page catalogue of "Osram" valves covering all types for broadcast receivers. Tuning indicators, gasfilled relays and special types are also included, while the catalogue contains very complete technical data with characteristics and curves.

Renold & Coventry Chain Co., Ltd., Didsbury, Manchester.—A leaflet dealing with driving chains.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A pamphlet describing a.c. switchboard instruments.

Superlamp, Ltd., 6, Paul Street, Finsbury Square, London, E.C.2.—A catalogue dealing with opal lighting units for office, warehouse and shop lighting.

A. P. Lundberg & Sons, Ltd., 477 to 489, Liverpool Road, Holloway, London, N.7.—A revised price list of "London" and "London Junior" switches.

Hart Accumulator Co., Ltd., Stratford, London, E.15.—A booklet dealing with emergency lighting equipment.

Bankruptcy Proceedings

T. B. Brown, trading under the stle of Brown & Senior, 5, Nelson Street, Dewsbury, wireless and electrical engineer.—The public examination herein was held at Dewsbury recently. According to the statement of affairs filed there were ranking liabilities of £316 and assets of £43, leaving a deficiency of £273. The examination was closed.

W. Sims, 16, St. James' Terrace, Buxton, electrical engineer, formerly carrying on business at 91, Spring Gardens, Buxton.—This debtor's public examination was continued at Stockport recently. It was stated that there were assets of £93 and a deficiency of £482. Debtor said that he commenced trading as an electrical contractor at Buxton in 1923. The business consisted of wiring work and lighting contracts. In 1931 he opened a business at Spring Gardens. He sold a considerable number of wireless sets, instruments, &c., in the first two years, but afterwards those sales declined. The examination was closed.

G. H. Honeysett (trading as Honeysett Radio), 71a, Manchester Street, Poplar, E.—A sitting of the London Bankruptcy Court was appointed to be held on November 12th before Mr. Registrar Kean for the public examination of this debtor. Mr. S. W. Hood, Official Receiver, reported that the receiving order was made on May 29th, and the debtor was adjudged bankrupt on June 2nd. She lodged a statement of affairs, but subsequently disappeared and was believed to be at present somewhere in Oxfordshire. The debtor and others were arrested on conspiracy and false pretences charges. On November 5th two of the prisoners were sentenced to 21 months' imprisonment, while the debtor and another were bound over for two years after she had pleaded guilty to the charges. The sitting was adjourned generally.

C. G. Crowther, radio electrician, 92a, King Cross Street, Halifax.—Receiving order made November 11th on debtor's own petition.

H. A. Simpson and **E. Dyson** (Simpsons), radio and electrical engineers, 18, Eastbank Street, Southport.—Receiving order made November 10th on debtor's own petition. First meeting November 20th at the Official Receiver's offices, Government Buildings, Victoria Street, Liverpool. Public examination January 12th at the Court House, Liverpool.

W. A. Jolly (Globe Equipment Co.), dealer in wireless parts and accessories, 36, Foleshill Road, Coventry.—Discharge suspended for six months until April 13th, 1937.

W. S. Hart, electrician, 34, Arthur Street, Portsmouth.—Trustee, Mr. A. L. Medcalf, 87, High Street, Portsmouth, Official Receiver, released November 3rd.

A. Ambrose, electrical engineer, 137, Market Street, Chorley.—Trustee, Mr. H. Parker, 9, Fox Street, Preston, Official Receiver, released November 5th.

C. W. Tucker (Wilton Wireless Supplies), 11, Silver Street, Wilton, Salisbury.—First and final dividend of 9½d. in the £, payable November 19th, at 12, Rolleston Street, Salisbury.

R. Field, electrical engineer, 61, Drewton Street, and 156, Westgate, Bradford.—Trustee, Mr. W. F. Cresswell, 71, Manningham Lane, Bradford, Official Receiver, released October 29th.

P. M. Gill (Swinton Radio Service), radio and electrical dealer, 166-170, Partington Lane, Swinton.—Last day for receiving proofs for dividend, November 25th. Trustee, Mr. F. H. Langmaid, Byrom Street, Manchester, Senior Official Receiver.

P. K. Eichenberger, wireless dealer, 30, Market Place, Boston.—First and final dividend of 9s. in the £1 payable November 14th at 1, St. Swithin's Square, Lincoln.

J. E. Madden, wireless dealer, 113, Bradford Road, Huddersfield.—First dividend of 8s. in the £ payable November 20th at 23, John William Street, Huddersfield.

Company Liquidations

Gorst Electrical Co., Ltd., Gorst Road, Acton, N.W., radio manufacturers.—The statutory meeting of creditors of the above was held on November 10th at the Cannon Street Hotel, Cannon Street, E.C.4. The statement of affairs prepared to November 1st, 1936, showed that there were unsecured creditors' claims of £16,132. The net assets were £6,480, leaving a deficiency, subject to the costs of liquidation, of £9,652. A creditor moved that the company should be wound up in compulsory liquidation and this was seconded, but after discussing the matter it was decided that the voluntary liquidation of the company should be continued with Mr. W. A. J. Osborne as liquidator with a committee of inspection consisting of the representatives of the Mullard Wireless Service Co., Ltd.; W. and T. Lock; Goodall Advertising Co.; Tungsram Electric Co.; and Mr. O. G. Sunderland representing creditors.

Chiswick Electricity Supply Corporation, Ltd.—Meeting December 14th at 796, Salisbury House, London Wall, E.C.2. to receive an account of the winding-up by the liquidator, Mr. O. W. Williams.

Glantawe Electric Supply Co., Ltd.—Particulars of claims by November 24th to the liquidator, Mr. D. J. Rees, Atlantic Buildings, Gloucester Place, Swansea.

Jones Bros (Blackpool), Ltd.—Meeting December 18th at 47, Mosley Street, Manchester, to receive an account of the winding-up by the liquidator, Mr. A. T. Eaves.

Orbit Traversing Fan Co., Ltd.—Meeting December 14th at 19, Coleman Street, E.C.2, to receive an account of the winding-up by the liquidator, Mr. H. E. Hill.

Private Arrangement

S. Wenzerul, trading as Eaton's Stores, 250, Bethnal Green Road, London, E.2, electrical dealer, &c.—The creditors of the above were called together on November 16th at the offices of Messrs. W. H. Cork & Co., accountants and auditors, 19, Eastcheap, London, E.C., when a statement of affairs was submitted which showed liabilities of £3,266 and net assets of £231, leaving a deficiency of £3,035. The debtor attributed his position to heavy overhead expenses, which had exceeded the gross profit of 5 per cent. That gross profit was something like 10 per cent. below the normal, but prices had been cut to meet keen competition. The debtor's solicitor suggested that the debtor should be given seven days in which to consult his friends with a view to an offer being submitted. It was resolved that the debtor should be given time in which to submit a guaranteed offer of 7s. 6d. in the £, failing which the estate should be dealt with in bankruptcy.

Dissolution of Partnership

Static Condenser Co., manufacturers of electrical condensers, 11, Eden Street, Hampstead Road, London.—Messrs. M. R. Wigg, R. M. Wigg and J. A. Wigg have dissolved partnership. Mr. J. A. Wigg will attend to debts and will carry on the business.

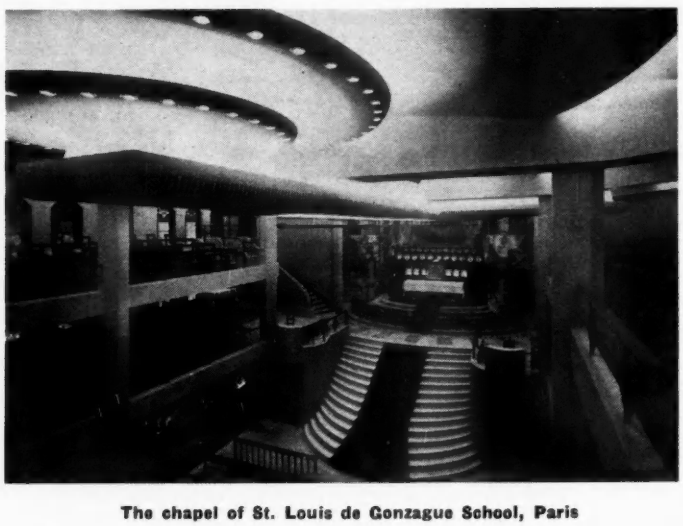
Electricity Supply

Lighting, Domestic, Power

Ashby-de-la-Zouch.—OVERHEAD LINES.—The Urban District Council has consented to the Leicestershire & Warwickshire Electric Power Co. erecting overhead lines for a supply at Blackfordby.

Belgium.—ELECTRICITY SUPPLY PROGRESS.—The Union des Exploitations Electriques en Belgigue recently published in its *Bulletin* a report showing that the installed capacity of the generating stations affiliated to the Union at the close of last year represented a fairly considerable increase as compared with December 31st, 1934, and that the output during the twelve months advanced from 1,712 million to 1,903 million kWh. In addition, power to the extent of 108 million kWh was purchased from stations not in the Union. Of the output, 9.6 per cent. was used for private lighting and household purposes, 0.8 per cent. for public lighting, 5.1 per cent. for low voltage power, 10.3 per cent for traction, 60.1 per cent. for high voltage power, and 14.1 per cent. was supplied to small distribution undertakings. The number of communes supplied with power rose from 1,941 to 1,965, and the number of consumers from 1,188,000 to 1,239,000. The length of high voltage overhead lines increased from 4,047 to 4,968 miles; high voltage underground cables from 4,887 to 5,028 miles; low voltage overhead lines from 15,894 to 17,312 miles; and low voltage underground mains from 1,625 to 1,694 miles. The report adds that there are now only about 37 small communes in Belgium, with an average population of 400, to which a supply of electricity is not as yet available.

Czechoslovakia.—USE OF ELECTRICITY.—Sales of electricity by the larger electrical enterprises in Czechoslovakia during 1935 increased by about six per cent. according to figures recently published. Public utilities were responsible for 720,400,000 kWh, or about 60 per cent. of the total kWh sold.



The chapel of St. Louis de Gonzague School, Paris

Dorchester.—CHRISTMAS ILLUMINATIONS.—During the Christmas shopping period the charge for the supply of energy for strip lighting in the main street will be 1½d. per kWh, provided it is not being used during peak load hours. Should any private shop owners require to illuminate their shop premises, it is recommended that they shall be charged at the same rate, provided a stipulated quantity of energy is consumed.

Durham.—SUB-STATIONS.—Schemes have been approved by the County Council for the erection of sub-stations by the North-Eastern Electric Supply Co., Ltd., at Ebchester, Sedgefield and Haverton Hill-on-Tees.

East Grinstead.—ELIMINATING RADIO INTERFERENCE.—The Urban District Council proposes to install resonant shunts to eliminate as far as possible the 300-cycle ripple from the mercury arc rectifier at the power station.

Finland.—PROPOSED HYDRO-ELECTRIC STATIONS.—While the construction of the large power station on the Rouhiala rapids in the Vuoksen, near Imatra, is still proceeding, a Finnish newspaper states that the plans for another large station at Harjavalta, on the River Kumo, have begun to assume a more definite shape. The aim in this case is that the station shall be able to generate 325 million kWh annually, a considerable part of which will be absorbed by a new chlorine works.

Fort William.—COUNCIL TO PURCHASE COMPANY'S PLANT.—An agreement has been concluded between the Town Council and the Fort William Electric Lighting Co. under which the Council is to purchase the company's plant for £2,500.

LOCHABER POWER SCHEME.—The Council is to hold a joint conference with the promoters of the Caledonian Power Scheme. This will be the first official meeting of the two parties since the revival of the scheme, which involves the expenditure of £2,500,000 on hydro-electric development and the erection of a carbide factory at Lochaber.

France.—SPECTACULAR CHAPEL LIGHTING.—An interesting example of the use of lighting for decorative purposes is the installation in the chapel of St. Louis de Gonzague School, Paris. Light-tubes are used for ordinary illumination and incandescent lamps for decorative effects. The main illumination is obtained from a cross-shaped trough suspended from the ceiling; this is equipped with a double row of light-tubes in lengths of from 2 to 3 metres and of from 20 to 24 mm. diameter. Thirty-eight 220/3,000-V, 200 mA transformers are provided for these tubes. The decorative lighting takes the form of illuminated stained glass windows set in front of small niches, and the illumination of the altar.

HYDRO-ELECTRIC SCHEME.—The French Government has recently granted a concession to the Société des Forces Motrices de la Haute Durance, for the establishment of a new hydro-electric generating station on the River Durance, near Ventavon in the Upper Alps Department, for the supply of power to the distribution system of the Société d'Energie Electrique du Littoral Mediterraneen. The gross and net amounts of power available are estimated at 44,700 kW and 27,100 kW. The work will include the construction of a dam measuring 370 ft. across the sill, a canal about 9 miles in length, and five penstocks 7 ft. 6 in. in diameter, two having a diameter of 3¼ ft. and one of ferro-concrete with a diameter of 9 ft. 2 in., their length being approximately 1,180 ft.

Glasgow.—EXTENSIONS AT DALMARNOCK.—In connection with the extension of Dalmarnock generating station the secretary of the Electricity Commission has intimated to the Electricity Committee that the Commissioners have agreed to sanction the borrowing of £84,100, repayable within thirty years, in respect of buildings and civil engineering works, and within twenty years in respect of generating plant, lighting and telephone installation, &c.

Grimsby.—CHRISTMAS ILLUMINATIONS.—With the object of attracting country people to the town for Christmas shopping a scheme of illuminations for the principal shopping centres has been prepared by the electrical engineer (Mr. S. R. Windle). It will be in operation for about ten days, both strip lighting and set-pieces being used.

Great Yarmouth.—NEW CABLES.—The Electricity Committee is to lay additional cables to Acle and Newtown at a cost of £15,507.

Japan.—MERGER PROPOSALS.—A *Reuter* report from Tokyo states that after a series of conferences the presidents of five large electricity companies in Japan are reported to have agreed to merge the companies into one if State control is necessary. They express the opinion that the best way to settle the electricity problems of the country would be to entrust the management of electricity enterprises to a private company under strong Government control, in accordance with the existing electricity regulations. It was announced in September that the Government proposed to put under State management five of the biggest electricity companies. It was estimated that as a result the cost of electric power would be lowered by 20 per cent. On August 11th the Cabinet rejected a proposal of the Minister of Communications to nationalise electrical enterprises. The Minister's plan, announced in June, was for State control of the industry by the setting up of a State company with a capital of about £116,000,000. Control was to begin in 1938.

Kincardine.—USE OF WOODEN POLES.—An objection by the Laurencekirk Town Council to the erection of wooden poles for overhead distribution lines in the main street of the town was not sustained by the Roads Committee of the County Council at its recent meeting. Speaking on behalf of the Town Council, Provost John Thom said it would be prepared to allow the Grampian Electricity Company to erect ornamental steel poles, but it certainly objected to wooden poles in High Street; they could be erected in other streets. Mr. Partington, on behalf of the company, said it did not believe that ordinary wooden poles would be by any means unsightly. The use of steel poles would increase the cost by £300.

Middlesbrough.—NEW CABLE.—Plans have been approved by the Town Council for the laying of an underground electric cable from Wellington Street to Connals Wharf by the North-Eastern Electric Supply Co., Ltd.

Newcastle-on-Tyne.—ACQUISITION OF ELECTRICITY UNDERTAKING.—The City Council is being recommended by the Parliamentary Committee to obtain expert advice at a cost of £525 on the question of the City Council taking over electricity distribution in the city. Options held by the Council to take over the distribution from the North-Eastern Electric Supply Co., Ltd., and the Newcastle and District Electric Lighting Co., Ltd., mature on July 3rd, 1937, and expire on January 3rd, 1938. It is proposed to obtain the services of Mr. J. H. Baker and Mr. Arthur Collins. It is understood unofficially that the cost to the City Council of acquiring the system in the city area will be £2,500,000.

NEW LIGHTING SCHEME.—As briefly mentioned in our last issue, a new system of street lighting was recently inaugurated in the Walker district of the city. Among those present during the ceremony were the Lord Mayor of Newcastle (Alder-

man W. Locke), Councillor T. H. Hurst (chairman of the City Lighting Committee), Mr. H. A. Couves and Mr. A. Bonnin (director and general manager, and director, respectively, of the North-Eastern Electric Supply Co., Ltd.), and Mr. J. Y. Fletcher (director of the General Electric Co., Ltd.). The complete scheme includes seven miles of main thoroughfare and fifteen miles of residential roads. In Shields Road, which is 40 ft. wide, the units consist of 400-W electric-discharge lamps in G.E.C. "Di-fractor" lanterns spaced 120 ft., and at a mounting height of 24 ft. The existing traction poles are fitted with special swan-neck brackets from which the new lighting units are suspended. Time switching is by fully automatic solar dial Venner switches arranged in groups of eight points per switch. Electric-discharge lamps (400 W) are also to be used for lighting Welbeck Road and Walker Road, which are also main thoroughfares. In Scroggs Road, a new 30 ft. main suburban road which joins up with the traffic arteries, 250-W discharge lamps are used in similar lanterns to those in Shields Road at 150 ft. spacing and a mounting height of 25 ft. New street poles with a 5 ft. projection over the roadway have been erected. These were specially designed to the requirements of the North-Eastern Electric Supply Co., Ltd., and house G.E.C. control auxiliaries and Venner time switches in the base. Overhead, Ltd., were the contractors for the whole of the erection work. The installation when finally completed will consist of some 250 "Di-fractor" lanterns for the electric-discharge lamps, with all necessary control gear, and 450 G.E.C. directional reflectors to be equipped with tungsten filament lamps. In Whinneyfield Road, which is 20 ft. wide, 100-W "Osram" lamps are used at 150 ft. spacing and 15 ft. mounting, this lighting being typical of that to be employed in similar roads throughout the Walker area.

Electric-discharge lighting in Shields Road, Newcastle

Paignton.—DECORATIVE LIGHTING.—The Urban District Council is reported to be considering decorative lighting for the sea front next year.

IMPROVING EXISTING STREET LIGHTING.—The Council's surveyor proposes to submit a comprehensive report on the street lighting of the town with suggestions for improvements by means of reflectors without increasing maintenance costs.

Paisley.—LOANS.—Approval has been given by the Town Council to a recommendation that application shall be made for authority to borrow the following sums:—Hired appliances, £25,000; meters, £5,000; hired installations, £2,000; mains and services, £5,000; and specified distribution extensions, £4,450.

Russia.—SHORTAGE OF ELECTRICITY FEARED.—In spite of the programme which calls for the production of 32 milliards of kWh this year, or over 6 milliards more than was produced last year, it is feared that there will be a shortage of supplies before the end of the year. With a view to remedying this situation the Council of the Commissars of the People has issued an order requiring industrial establishments to reduce their consumption per unit of goods manufactured by 10 per cent. Lighting in offices and streets will be reduced by 15 per cent. In addition, there are to be certain increases in charges; electricity for domestic lighting is not affected.

TRANS-URAL TRANSMISSION LINE.—The first 140-mile section of a 70-mile transmission line from south to north of the Urals has been practically finished. The complete system will embrace thirteen new power stations.

Sheffield.—SUPPLY FOR RAILWAY ELECTRIFICATION.—The electrification of the L.N.E.R. line between Manchester and Sheffield was mentioned at the annual dinner in Sheffield on Saturday evening of the Electrical Trades Union. According to the *Manchester Guardian*, Mr. J. R. Struthers, general manager, Sheffield Electricity Department, said he expected that the power would be supplied by the Sheffield and Manchester Corporations and the Yorkshire Electric Power Co. and that Sheffield and Manchester would each supply 15,000,000 kWh, which was about 25 per cent. Sheffield Electricity Department, he said, was getting more applications for power than it could deal with, and he had difficulty in getting plant to meet requirements. Just recently, after a discussion with the Central Electricity Board, it was decided that Sheffield should have another 50,000-kW alternator and another one next year. They had recently installed a 30,000-kW set and two more were on order. Last year the consumption of electricity was 404,000,000 kWh. This year he expected the amount would be 500,000,000 and the year after, he said, it would be up to 600,000,000 kWh if they went on as they had been doing recently.

Municipal Electricity Undertakings' Results

BELOW are given the financial results and sales of further municipal electricity supply undertakings for 1935-36. The actual increase in electricity sold at Nelson does not reflect the extent of the expansion generally on account of a loss of about two million kWh by reason of the replacement of trams by buses. At Wallasey nearly 700 new premises were connected, mainly new properties, as nearly all the existing premises in the town have electricity already installed. There was a big increase in the number of appliances on hire and the kWh consumed per head of the population rose by 52 to 310. At Southampton the corresponding figure was 314, this being the first complete year of operation under the Central Electricity Board.

A record number of new consumers (746) was obtained at Middleton and good progress is reported from Liverpool, where over 16,800 cookers, 2,300 wash-boilers and 1,300 radiators have been supplied on hire and are maintained by the Electricity Department. At Cheadle and Gatley the quantity of electricity sold increased from 6,296,606 kWh to 8,066,970 kWh. The amount sold by the undertaking under the domestic all-in rate was almost doubled—the total increasing from 1,467,985 to 2,845,009 kWh.

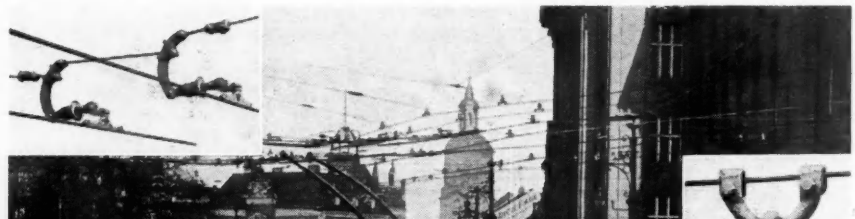
Town.	Engineer.	Total Revenue.		Working Expenses.		Net Profit.		Sales of Electricity.		
								Thousands of kWh.		Percentage Increase.
		1934/35.	1935/36.	1934/35.	1935/36.	1934/35.	1935/36.	1934/35.	1935/36.	
		£	£	£	£	£	£			
ng Eaton	J. Barnett Feltham ...	41,231	45,179	29,205	31,457	452	1,904	5,956	6,350	6.6
Middleton	A. M. Mulliner	55,809	58,018	47,250	49,036	2,206	2,120	13,992	14,734	5.3
ountain Ash	E. W. Jones	22,151	30,344	18,413	28,036	3,218	2,023	2,039	2,258	10.7
elson	T. Dawson Martin ...	88,641	94,985	58,377	64,906	7,803	4,292	15,086	17,089	13.2
ewport	A. Nichols Moore ...	231,333	238,372	129,754	172,314	*1,217	*1,901	53,482	50,481	−6.5
orwich	V. Alexander Pask ...	386,227	422,816	255,165	277,804	39,999	38,900	55,983	63,594	13.6
oplar	R. Illingworth	273,249	289,253	183,314	195,368	39,113	39,869	50,768	55,905	10.1
ortsmouth	B. Handley	397,894	454,071	219,499	303,290	46,710	58,704	82,643	85,213	3.1
reston	D. Adams	411,339	473,399	277,743	336,865	6,174	9,280	135,250	150,395	11.1
awtenstall	J. E. Shepherd	87,852	101,382	61,535	75,862	5,461	3,911	16,985	18,343	7.9
t. Helens	W. S. Johnston	175,630	194,507	115,655	132,701	35,237	31,718	51,877	57,939	11.6
alford	L. Romero	392,631	425,488	212,961	239,417	32,360	30,832	91,077	102,178	12.1
heffield	J. R. Struthers	1,177,278	1,259,859	600,316	710,222	164,424	117,795	316,136	404,313	27.8
outhampton	W. G. Turner	328,169	351,906	184,623	237,832	6,585	*4,994	67,491	69,421	2.8
outh Shields	N. T. Smith	118,965	124,956	67,097	69,940	*3,384	265	12,638	14,007	10.8
tockton-on-Tees	S. G. Marston	72,155	81,164	46,032	50,708	6,552	12,002	9,860	11,952	21.2
tretford	T. A. Kerr	359,636	381,028	231,840	282,828	32,407	12,344	123,951	143,977	16.1
allasey	B. T. Hawkins	225,106	215,890	139,362	141,437	29,076	18,483	25,158	30,242	20.2
allsend	A. W. Barham	180,890	203,559	101,591	119,495	21,358	23,394	44,630	55,219	23.7
Whitehaven	J. D. Spark	290,762	318,690	218,725	245,633	22,548	22,931	58,558	66,958	14.3
Winchester	R. Ayton	56,210	60,588	36,832	37,993	1,529	4,821	3,434	3,928	14.3

* Net loss.

St. Helens.—NEW TARIFF.—The Corporation is offering to supply electricity at 1½d. per kWh for outside shop lighting which does not in any way replace inside lighting, and neon or other advertising signs. A minimum consumption or a guarantee of 30s. per annum is stipulated.

Stockton-on-Tees.—SUB-STATION.—The Town Council is to erect a sub-station in Norton Road and sanction has been received to borrow £400 for the building and £2,400 for the equipment.

Tanfield.—BULK SUPPLIES.—At a meeting of the Urban District Council reference was made to the impending amalgamation of the Tanfield, Annfield Plain and Stanley districts, and it was agreed to set up a committee to consider the question of a bulk supply of electricity to serve the three areas when the union takes place.



Experimental trolley-bus service in Berlin. Left inset: Type of suspension used on the more severe curves. Right inset: Chain-type suspension

United States.—TRANSMISSION IN THE T.V.A. AREA.—The *Electrical World* reports that engineers of the Commonwealth and Southern Corporation, the Tennessee Valley Authority, and the Federal Power Commission are engaged in a survey of power transmission systems in the T.V.A. area. Physical data relating to the situation, capacity and length of existing transmission lines is being gathered, with information regarding the communities of the area and their power requirements. The investigators are not dealing with the sources of power or distribution systems. The survey is part of President Roosevelt's constructive plan for the proper development of the nation's power resources.

Walton and Weybridge.—COUNCIL HOUSE INSTALLATIONS.—The electrical installations throughout the Council's housing estate are to be modernised.

West Hartlepool.—MAINS AND SERVICES.—Sanction has been received by the Town Council to a loan of £10,000 for mains and services.

Weymouth.—RURAL EXTENSIONS.—The Electricity Committee is to extend mains to Winfrith and Poxwall Manor at a cost of £220.

Willesden.—STREET LIGHTING.—Mr. J. D. Spark, the electrical engineer and manager, informs us that the Council has decided to effect improvements in the public lighting of the whole of the tramway routes in the borough which have now been converted to trolley-bus services. Some 6¾ miles of public roadway are affected, involving 300 lamps, and the whole of the existing lighting is being superseded by 250 W "Osira" electric discharge mercury vapour lamps.

Woking.—CHEAPER ELECTRICITY.—From the beginning of January the "unit" charge under the all-in tariff of the Woking Electric Supply Co., Ltd., is to be ⅛d. all the year round, instead of ¼d. in the winter and ⅛d. in the summer. Electricity for shop-window lighting is to be charged at 1d. per kWh during December, a basis of 26 hours a week having been fixed.

Traction

Belgium.—SUCCESS OF ELECTRIFICATION.—In its annual report on economic conditions the Belgian National Bank states that despite certain initial difficulties the electrification of the Brussels-Antwerp railway (opened early in 1935) has given satisfaction, and that there is evidence to show that if electrification had not been undertaken the passenger traffic between the two cities would have fallen off, whereas actually it has increased.

France.—NEW PROJECT.—A preliminary survey in connection with the proposed electrification of the 130-mile main line of the Midi Railway from Bordeaux to Montauban has been completed. Although conversion has not been sanctioned, it is expected that permission will be granted after the completion of the Narbonne-Port Bou line, now in course of electrification.

Germany.—BERLIN TROLLEY-BUS EXPERIMENT.—With a view to testing the possibilities of the trolley-bus an experimental service has been started between Spandau and Staaken, Berlin, and several interesting features are incorporated. In order to obtain maximum flexibility the contact wires are provided with a chain type suspension except for the more severe curves, when a type of suspension is employed which minimises swaying of the wires. Crossing the existing tram contact wires is effected by the use of insulators set into the length of the trolley wires. The buses used are three-axled 70-seater vehicles weighing about 70 tons unladen and powered by two motors in tandem. Electrically, each of these motors is separate, but for reasons of space they are placed in a single housing between the front axle and the rear pair of axles. Compressed air braking is incorporated.

Italy.—RAILWAY ELECTRIFICATION.—Steady progress is being made with the electrification of the Italian State Railways, says *Reuter's Trade Service* from Rome. Not long ago a further sum of 1,200 million lire was authorised to be used to complete the plan for the electrification of about two-thirds of the traffic on the railways. The new plan put forward by the Minister of Communications in 1933 provided for the conversion of all the main lines of the Italian railway system. As a first section of the work, 1,400 km. was to be electrified in four years. To-day all the important lines through the passes of the Apennines are electrified and before long most of the frontier Alpine passes will have been similarly treated. It may be assumed that the last section of the Tyrrhenian coast line will soon be finished and probably also the Bologna-Milan section. In any case, states *Il Sole*, the Salerno-Reggio Calabria line will be completed before the end of next year.

TRAVELLING SUB-STATION.—The tramway system of Rome has been equipped with a steel-tank mercury arc rectifier sub-station rated at 535 kW, which, with its attendant switchgear, is mounted on a special trolley wagon and can be moved from point to point as required. It takes a three-phase supply at 10 or 20 kV, 45 cycles, and converts it to 725 V, d.c.

NEW TROLLEY-BUS SYSTEM.—A new trolley-bus system is being introduced in Leghorn. It is to be fed through three 600-kW mercury-arc rectifiers and will be operated at first by thirty-five vehicles.

Sunderland.—TRAM TRACK EXTENSION.—The Town Council at its monthly meeting decided to apply for a Provisional Order to extend the Durham Road tram track.

United States.—FAST ELECTRIC SERVICE.—Once again the Pennsylvania Railroad has speeded up its single-phase electric trains between Washington and New York. The fastest train, the "Congressional," now covers the 225 miles in 215 min. inclusive of six stops, and the fastest intermediate start-to-stop speed is 75 m.p.h.

Communications

France.—THREE MILLION RADIO LISTENERS.—On October 1st the number of French listeners was 3,031,526. France is now third among European countries in the matter of listeners, the first two being Great Britain and Germany. Sweden, which follows France, has rather fewer than one million listeners.—*Wireless World.*

Great Britain.—MORE RADIO LICENCES.—The number of radio licences in force at the end of October was 7,853,131, representing a net increase of 580,000 during the twelve months.

NEW CABLE.—A new co-axial cable has been laid between London and Birmingham, and an early start is to be made on a new section between Birmingham and Manchester.

Irish Free State.—NO SHORT-WAVE STATION.—In the Dail last week Mr. Oscar Trayner, Minister for Posts and Telegraphs, said that the question of the erection of a short-wave broadcasting station in the Irish Free State had been reconsidered by his Department, but it was not found practicable to proceed with the project at present. The approximate cost of the erection of such a station would be £46,000, with an additional maintenance cost of about £15,000.

United States.—TELEVISION.—It is reported in the *Daily Telegraph* that four television transmitters are expected to be ready next year, two in New York, one in Philadelphia and one in Hollywood. The definition is to be 441 lines.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Amble.—December 14th. U.D.C. Electricity Department. Cables, feeder pillars, 2,200-V overhead line. (See this issue.)

Argentina.—BUENOS AIRES.—November 24th. State Railways Administration. Fourteen portable electric arc welding sets. (T.Y. 30898.)*

December 1st. State Oilfields Directorate. Copper wire, flexible cable, conductors, plugs, sockets, &c. (T.Y. 30913.)* Cables and wires. (T.Y. 30916.)*

Australia. — BRISBANE. — January 6th. Brisbane Electric Light Co. 44,000-V, 3-phase, 50-cycle switchgear. (T.Y. 30921.)* MELBOURNE.—December 1st. Posts and Telegraphs Department. Cable and loading coil cases. (T. 30928.)*

December 8th. Underground and submarine cable and loading coil case. (T.Y. 30939.)*

December 15th. State Electricity Commission of Victoria. Two combined regulating and non-return valves at the Yallourn power station. Agent-General for Victoria, Victoria House, Melbourne Place, London, W.C.2 (deposit 10s.).

Barnoldswick.—November 28th. U.D.C. Electricity Department. One 6.6-kV stationary type feeder cubicle, and transformer kiosk sub-station, with ring-main equipment. (November 13th.)

Barnstaple.—November 30th. Corporation. Motor generator, switchgear and connecting cables. (November 6th.)

Birmingham.—November 30th. Electric Supply Committee. Transformer and switch oils. (See this issue.)

Blackpool.—December 2nd. Borough Council. Pumping plant, with all necessary electric motors, starters, switchgear, &c., at the Manchester Square pumping station. Borough engineer, Municipal Buildings, Talbot Square (deposit £1).

Bootle.—November 23rd. Coronation Sub-Committee. Illuminating public buildings for the Coronation celebrations in May, 1937. Borough engineer and surveyor, Town Hall.

Brighton.—November 23rd. Mental Hospital Visiting Committee. Electrical wiring installation at the new Admission Hospital, Haywards Heath. (November 6th.)

Bristol.—November 27th. Corporation. L.v. switchgear. (November 13th.)

December 3rd. Switchgear, transformers, reactors, &c., in connection with a new distributing centre. (November 13th.)

Cleethorpes.—November 23rd. U.D.C. Equipment with necessary material for 2¼-miles of trolley-vehicle overhead construction, to include turning circles and depôt equipment; or, alternatively, the supply of tubular steel poles, trolley and galvanised steel wire, and overhead fittings. A. S. Barter, clerk to the Council, Council Offices.

Coventry.—Electricity Committee. Coal and ash-handling plant, reinforced concrete coal store and turbo-alternator foundations, at the Longford generating station. (See this issue.)

Darlington.—Town Council. Generating plant at the electricity works. Merz & McLellan, consulting engineers, Carliol House, Newcastle-upon-Tyne.

Dufftown.—November 23rd. Town Council. Electric street lighting installation. Town Clerk's Office.

Dumfries.—December 18th. Electricity Department. Two 200-kVA transformers and two 3-panel, h.v. metal-clad switchboards. (See this issue.)

East Grinstead.—November 21st. U.D.C. Electric cookers for one year. (November 6th.)

Elton.—November 30th. Town Council. Electric street lighting installation. H. A. Emslie, town clerk, 87, Station Road.

Epsom and Ewell.—December 14th. U.D.C. Electricity Department. Cable. (See this issue.)

Farnworth.—December 10th. U.D.C. Electricity Department. Cables. (See this issue.)

Fife.—November 30th. County Council. Electric lighting in sixty-eight houses at High Valleyfield. C. R. Douglas & Son, 15, East Port, Dunfermline (deposit £1 1s.).

December 5th. Electrical installation and heating engineering work at Tayport Higher Grade school. G. Sandilands, county master of works, Property and Works Department, County Offices, Wemyssfield, Kirkcaldy (deposit £1 1s.).

Fraserburgh.—November 24th. Town Council. Electric lighting works at the reconstruction of the Hanover Street housing estate. Burgh surveyor (deposit £1).

Gosforth.—December 1st. U.D.C. Electrical installations in ninety-four houses on the Hollywood Avenue estate. (November 13th.)

Halifax.—November 30th. Watch Committee. Various works, including electrical, at the branch police station, Salterhebble. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

November 23rd. Electric lighting at Warley Road Infants' School. D. T. Lloyd Jones.

Hastings.—December 3rd. Electricity Department. One kiosk, with 11-kV switchgear, for Brede Hill. (See this issue.)

Hull.—December 15th. Electricity Committee. Coal handling extensions comprising weighbridge, rotary wagon tippler and coal-elevating gear. (November 13th.)

Irish Free State.—ELECTRICITY SUPPLY BOARD.—December 28th. Two 15,000-kVA transformers with on-load tap-changing equipment. (November 13th.)

Kingston-upon-Thames.—December 2nd. 3,300-V sub-station switchgear. (November 6th.)

Liverpool.—November 24th. Corporation. Construction of police wireless transmitting station, Allerton. Land steward and surveyor, Municipal Buildings.

London.—HACKNEY.—November 25th. Borough Council. Electrical installation for a block of 311 flats at Nisbet Street, E.9. (November 6th.)

December 21st. Two steam generating units and ancillary plant, and one 30,000-kW turbo-alternator, with condensing plant, &c. (November 6th.)

ISLINGTON.—December 2nd. Borough Council. Steel street lamp columns and electric-discharge lanterns, with other accessories. (November 13th.)

ST. MARYLEBONE.—November 24th. Borough Council. Two 150-Ah storage batteries; and transformers and switchgear for one year. (November 13th.)

Manchester.—November 27th. Electricity Committee. Electric water heaters for one year. (November 13th.)

Morley.—December 9th. Electricity Committee. Cables, switchgear and transformers. (November 13th.)

New Zealand.—AUCKLAND.—November 30th. Electric Power Board. Twenty 200-kVA and twenty 300-kVA transformers. (T.Y. 30909.)*

WELLINGTON.—January 26th. Public Works Department. Four 750-kVA transformers. (T.Y. 30911.)*

January 26th. Public Works Department. Four 750-kVA transformers. (T.Y. 30911.)*

Northern Ireland.—BELFAST.—November 30th. Harbour Commissioners. Stores, including electrical fittings, for one year. M. J. Watkins, general manager and secretary, Harbour Office.

Otley.—November 23rd. Education Committee. Electric lighting at North Parade Council school. Education officer, County Hall, Wakefield.

Plymouth.—December 5th. Corporation. Fire extinguishing equipment for the Prince Rock generating station. City electrical engineer.

December 12th. Coal-handling conveyor, telpher and extensions to existing coal-handling equipment. (See this issue.)

Rotherham.—November 28th. Transport Department. Eight single-deck trolley-bus chassis and bodies. T. P. Sykes, transport manager, Municipal Offices, Howard Street.

Shoreham-by-Sea.—November 23rd. U.D.C. Lighting Parkside Street, Kingston-by-Sea, by electricity or gas. J. Dunn, surveyor, Town Hall.

South Africa.—PRETORIA.—December 30th. Public Works Department. Electric lifts. (T. 2153.)*

South Shields.—November 26th. Corporation. Electrical fittings and lamps for one year. (November 6th.)

Stoke-on-Trent.—December 9th. North West Midlands Joint Electricity Authority. Fire protection apparatus at the Stoke-on-Trent and Stafford generating stations. (See this issue.)

Uruguay.—MONTEVIDEO.—November 26th. State Electricity Supply and Telephones Administration. Bare copper wire for telephone lines. (T.Y. 30902.)*

West Lothian.—November 26th. County Council. Electrical work at new County Buildings and police station at Linlithgow. D. Peddie Todd and Jamieson, architects, 8, Albyn Place, Edinburgh, 2 (deposit £2 2s.).

Wolverhampton.—December 15th. West Midlands Joint Electricity Authority. Three 4,000-kVA, outdoor-type transformers, with on-load tap-changing apparatus. (See this issue.)

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* **Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.**

Contracts Closed

Aberdeen.—Town Council. Accepted. Electric lighting work in 126 houses on the Woodside estate (No. 4 section) (£604).—R. A. Mair.

Coulsdon.—Property Committee. Electrical installation at the Council Office extensions:

	£		£
C. F. Williams, Accepted	**490**	S. Goodchild	585
Regency Electrical Co.	518	A.S.E.	588
Johnson & Tanner...	527	G. E. Wallis & Sons	588
City Electrical Co....	530	Harland & Wolff	632
Instanta Electric	549	Pinching & Walton	633
G. Candler & Sons (Builders) ...	555	Crabb Electric (R. H. Crabb) ...	682
Grensells Electrical Contractors ...	551	John Lightfoot	683
J. L. Shadwell	556	John Holder & Co.	695
Alpha Manufg. & Electrical Co. ...	559	Dynamo & Motor Repairs ...	724
Speedy & Eynon	559	County of London Electric Supply	
Holliday, Hall & Stinson... ...	576	Co.	835

Crewe.—Town Council. Accepted. Transformer kiosk (£446).—Met.-Vick. Elecl. Co. Overhead cable for an extension to Mile House farm (£175).—B.I. Cables, Ltd.

Darlington.—Town Council. Accepted. Transformers.—Yorkshire Electric Transformer Co.

Fife.—County Council. Accepted. Electric lighting at the Rosewell housing estate (£495).—J. Scott & Co. Electric lighting at the Crosshill housing estate (£404).—Miller & Stables.

Glasgow.—Education Committee. Accepted. Electrical work at the Shawlands (Old) school (£573).—W. S. Watson, Ltd.

Electricity Committee. Accepted. Transformers.—Bruce Peebles & Co.; British Electric Transformer Co.

Huddersfield.—Corporation. Accepted. Conversion of the overhead equipment of the Marsden and Bradley sections of the tramway system, for trolley-bus operation (approximately 9¼ miles).—Clough, Smith & Co.

Lanark.—County Council. Accepted. Electric lighting work in ninety-two houses (£522) and fifty-six houses at Newarthill (£299).—D. Henderson.

Leicestershire.—County Council. Accepted. Electrical installations at the Melton Mowbray Institution (£499).—F. Webb & Son.

Ladybank (FIFE).—Town Council. Accepted. Electric lighting on housing estates.—R. Aitken.

London.—L.C.C.—Wiring and fittings for electric lighting, &c., in blocks 3, 5, 6, 8 and 9 of dwellings in the Sumner Road area, Camberwell:

	£		£
Buchanan and Curwen, Ltd. Accepted	**2,687**	Smith and Hammond, Ltd. ...	3,328
Pinching and Walton	2,713	Higgs and Hill, Ltd.	3,840
Read and Partners, Ltd. ...	2,772	Harland and Wolff, Ltd. ...	4,125
Jacob White and Co.	3,490	Frank Angell and Co.	5,266
B. French, Ltd.	3,554	G. E. Taylor and Co.	5,534

Wiring and fittings for electric lighting, heating and cooking in the remainder of block 2 of dwellings (Walker House) on the Ossulston estate, St. Pancras:

	£		£
Holliday and Son (Electrical), Ltd. Accepted...	**1,691**	Read and Partners, Ltd. ...	1,873
S. Reed and Sons	1,767	City Electrical Co.	2,182
A. Meckhonik	1,802	Henfrey Electrical Installations	2,199
Harland and Wolff, Ltd. ...	1,844	A. Hawkins and Sons	2,245
W. H. Gaze and Sons	1,860	Ryland's Electrical Co.	2,360

Wiring and fittings for electric lighting, &c., in blocks 1-6 of dwellings on the Upper Clapton Road site, Hackney:

	£		£
Buchanan and Curwen, Ltd. Accepted	***1,699**	F. G. Edey and Co.	2,225
A. Meckhonik	1,844	Francis Polden and Co.	2,402
Grant and Blake, Ltd.	1,870	Ilford Electrical Co.	2,614
G. E. Thomas and Co.	1,885	Newman and Watson, Ltd. ...	2,614
A. Hawkins and Sons	1,964	* Tender accepted on the basis of the amount of the tender being increased to £1,781 in respect of the variation of the specification to provide for an increase in the size of the lateral main cables.	
Anderson, Angell and Co. ...	2,009		
Evans and Shea	2,029		
Electrical Installations, Ltd. ...	2,120		
H. J. Cash and Co.	2,196		

Accepted. Wiring and fittings for electric lighting, &c., in twenty-six houses and flats and six workshops on the Bennett's Castle House site, Becontree (£247).—Evans & Shea. This was the lowest of seven tenders, the highest being £356. Wiring and fittings for an electric fire alarm system at the Ladywell Institution (£399).—S. Reed & Sons. (Lowest of twelve tenders, highest being £689.) Wiring and fittings for the extension at Holloway school (£703).—E. & C. Champion. (Lowest of five tenders, highest being £805). Electrical fittings.—British G.W.Z Battery Co.; Electric and Ordnance Accessories Co.; Ferguson Battery Co.; General Electric Co.; S. Heath & Sons; Hornby Electrical Supplies Co.; Horobin, Ltd.; Siemens Electric Lamps & Supplies; Sloan Electrical Co.; Sperryn & Co.; Tower Manufacturing Co.; J. H. Tucker & Co.; Wandsworth Electrical Manufg. Co.; Ward & Goldstone, Ltd.

Rutland.—Leicestershire and Rutland Joint Hospital Board. Automatic telephones at Mental Institution (£140).—T. H. Wathes & Co.

South Africa.—JOHANNESBURG.—Corporation. Accepted. Copper conductors.—British Insulated Cables (S.A.); British General Electric Co. Transformers.—Met.-Vick. Elecl. Export Co.

Forthcoming Events

Institution of Electrical Engineers.—Monday, November 23rd. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Electric Vehicles—Some Technical Aspects." To be opened by Mr. L. Murphy.

Mersey and North Wales (Liverpool) Centre.—Monday, November 23rd. Adelphi Hotel, Liverpool. Annual dinner.

North Eastern Centre.—Monday, November 23rd, Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Restriking Voltage, and Its Import in Circuit-Breaker Operation." Messrs. H. Trencham and K. J. R. Wilkinson.

Northern Ireland Sub-Centre.—Tuesday, November 24th. 9, Wellington Place, Belfast. 6.30 p.m. "The Effects of Impulse Voltages on Transformer Windings." Messrs. T. E. Allibone, D. B. McKenzie and F. R. Perry.

North Midland Centre.—Tuesday, November 24th. Hotel Metropole, Leeds. 7 p.m. "Cineradiography." Dr. Russell J. Reynolds.

Scottish Centre.—Tuesday, November 24th. Grosvenor Restaurant, Glasgow, C.2. 6.30 for 7 p.m. Annual dinner.

Wireless Section.—Tuesday, November 24th. Institution, London, W.C.2. 6.30 p.m. Informal meeting. Discussion on "The Scope of the Amateur in the Development of Radio Engineering." To be opened by Mr. H. Bevan Swift.

Irish Centre.—Thursday, November 26th. Trinity College, Dublin. 6 p.m. Paper by Messrs. T. E. Allibone, D. B. McKenzie and F. R. Perry.

West Wales (Swansea) Sub-Centre.—Thursday, November 26th. Technical College, Swansea. 6.30 p.m. "Equipment and Performance of Steel Tank Rectifier Traction Sub-Stations Operating on the London Underground Railways." Mr. A. L. Lunn.

South Midland Centre.—Friday, November 27th. Grand Hotel, Birmingham. 6.30 for 7 p.m. Annual dinner and re-union.

Electrical Trades Commercial Travellers' Association.—Friday, November 20th. Criterion Restaurant, London, W.1. Annual dinner and dance.

Birmingham Electric Club.—Monday, November 23rd. Grand Hotel, Birmingham. 7 p.m. Discussion on "Electrical Services in Large Buildings." To be opened by Mr. F. H. Carter.

Electrical Contractors' Association *(Manchester Area Branch).*—Tuesday, November 24th. Midland Hotel, Manchester. 6.15 for 6.45 p.m. Electrical trade dinner.

Electrical Industries Ball. — Tuesday, November 24th. Grosvenor House, London, W.1. 8.30 p.m.

Association of Supervising Electrical Engineers.—Wednesday, November 25th. Magnet House, Kingsway, London, W.C.2. 7.15 p.m. Joint meeting with the Institution of Engineers-in-Charge. "Television." Mr. G. C. Marris.

Radio Manufacturers' Association.—Thursday, November 26th. Annual banquet and ball.

Notes

Jury and Mechanised Mining

When the inquest on the fifty-eight victims of the Wharncliffe Woodmoor Colliery explosion on August 6th was concluded at Barnsley on Wednesday the jury returned a verdict of death by misadventure, to which they added a rider. In it they strenuously impressed on the Mines Department the urgent necessity for the immediate overhaul and examination of all phases of the present intensive and mechanised methods of mining with a view to tightening up the regulation and inspection of all mines under its control. They also expressed the view that the existing system of stone dusting (treatment of coal dust to prevent explosions) is unsatisfactory, and that the methods of employing electricity in mines should have the most serious consideration of the Mines Department.

World Standardisation

The present state of national and international organisation of standardisation is surveyed in a fifty-five-page report issued by the World Power Conference (36, Kingsway, W.C.2; 3s. 6d. net), which states that international co-operation does not appear to have reached the same level of effectiveness as national efforts. Single recognised standardising bodies exist in nineteen countries; one or more organisations are functioning, but are not recognised as central bodies, in each of four other countries; and in five more countries organisation has commenced. No standardisation at all has been attempted in Danzig, Egypt, India, or the Irish Free State. Twenty-five member countries of the World Power Conference are affiliated to the International Electrotechnical Commission and nineteen to the International Federation of the National Standardising Associations (I.S.A.). The World Power Conference has no intention of itself engaging in any standardising activities. It merely provides a forum for preliminary discussion and performs the function of a clearing house of information on standardisation already achieved.

E.A.W. Activities

Addresses on the World Power Conference were given by Miss Caroline Haslett and Mr. J. M. Kennedy, past president of the Institution of Electrical Engineers, at a meeting of the London Branch of the Electrical Association for Women held at the Institution of Electrical Engineers on Monday. Mr. H. T. Young, president of the I.E.E., was in the chair. Miss Haslett said that in the United States women were employed as home lighting advisers, being engaged by the utility companies to give free advice to consumers. Kitchen planning had reached a fine art, and it was possible to buy separately standard sized equipment to deal with the preparation and storage of food, the sink and dishwashing and the serving of food. Some of the larger electricity undertakings carried out reconstruction work in old kitchens. Miss Haslett drew attention to several of the latest developments in the U.S.A. which included an electrical garbage disposer, hot-plates which could be regulated to any degree of heat, silent switches and fans, and air conditioning. She considered that we were ahead of the United States in our use of heavy-consumption apparatus, though they used more refrigerators.

I.E.E. Students' Annual Smoking Concert

What must have been almost a record attendance rewarded the efforts of Mr. L. E. Maddams, the hon. assistant secretary for entertainments of the London Students' Section of the Institution of Electrical Engineers, in organising the annual smoking concert at the White Horse Restaurant last Tuesday. A general air of good comradeship pervaded the proceedings, which included entertainment by patter, conjuring and community singing.

Appointments Vacant

Electrical engineering assistants in the drawing office of the Air Ministry.

Area sales manager for the North Metropolitan Electric Power Supply Co.

Showroom manager and sales engineer for Burnley Electricity Department.

Draughtsmen, Grade I, for the Royal Aircraft Establishment, South Farnborough.

Demonstrator saleswoman for Warrington Electricity Department.

Burgh electrical engineer for Rothesay.

Mains assistant for Weymouth and Melcombe Regis Electricity Department.

Draughtsman for Worcester Electricity Department.

Electrician-mechanic for the Government of Nigeria.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

MONARCH wash boiler.

Readers should enclose stamped addressed envelopes when making their enquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. G. G. Mason, A.M.I.E.E., chief technical and research engineer of the Revo Electric Co., Ltd., has been appointed to take control of the company's new research laboratories. Mr. Mason, who received an intensive training in mechanical and electrical engineering at the Wolverhampton and Staffordshire Technical College, joined the company in 1931 as an assistant to the engineer and manager of the Appliances Department. He possesses an intimate knowledge of the developments which have taken place in the electrical domestic appliance industry, and has been closely connected with much of the company's development work, particularly in relation to the design and construction of electric cookers.

Mr. G. G. Mason

Councillor H. W. Barber, the Manchester branch manager of Johnson & Phillips, Ltd., was installed Mayor of Southport on November 9th. The ceremonies that attended and followed the installation were witnessed by a large and representative gathering, including Mr. R. S. Hudson, M.P. for Southport; Sir Philip Dawson, M.P., director of Johnson & Phillips, Ltd.; Mr. P. V. Brittlebank (sales manager); and Mr. W. Taylor (Manchester Branch).

The new Mayor greets Sir Philip Dawson

Mr. W. K. Fleming, A.M.I.E.E., for the past eight years electrical engineer and manager to the Royal Burgh of Rothesay, a town notable as an early pioneer in special illumination display schemes, has been appointed borough electrical engineer of Scarborough. Mr. Fleming had previously served for thirteen years with the Greenock Corporation electricity undertaking, where he received his engineering training, afterwards occupying the positions of technical assistant and consumers' and sales engineer. He also served for a period during the war in the Navy as electrical engineer. His education in mechanical and electrical engineering was received at Greenock Technical School and the Royal Technical College, Glasgow. He is a member of the E.D.A. Scottish Area Committee and a member of the I.M.E.A. Scottish Centre Committee.

Mr. W. K. Fleming

Mr. E. E. Judge, A.M.I.M.E., who, as we have already reported, has been appointed manager of the Gravesend works of W. T. Henley's Telegraph Works Co., Ltd., served his apprenticeship in the engineering shops, foundry and drawing office of Callender's Cable and Construction Co., Ltd., from 1900 to 1906. His theoretical training was received at the Woolwich Polytechnic, the Borough Polytechnic and the Northampton Institute. In 1906 he was appointed technical assistant in Callender's sales organisation. He joined Henley's in 1909, to assist in developing the cable accessory business of the Engineering Department and in 1910 he was appointed Engineering Department superintendent at Gravesend, new shops being built to cope with the increasing business. The successful development of this department resulted in his appointment as assistant works manager in 1919. In 1934 Mr. Judge became manager of the Gravesend works of Henley's Tyre & Rubber Co., Ltd., and in 1935 he resumed duties in the cable factory, occupying the dual posts of assistant works manager of the cable factory and works manager of the tyre factory. He visited the United States last year to study American methods of tyre and cable manufacture.

Mr. E. E. Judge

Mr. Judge, whose recent appointment embraces both the cable and tyre factories, has been responsible for introducing a number of patents, the most prominent being the original Henley unit pillar; the present standard disconnecting network box; and the straight-through lead press.

Mr. H. G. Pusey, A.M.I.Mech.E., was elected chairman of the Junior Institution of Engineers (Inc.) at the annual meeting of the Institution held on November 13th.

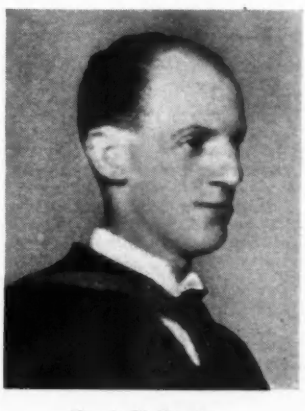
Mr. F. V. Jordan, A.M.I.E.E., who for the last three years has been chief engineer and manager to the Mosul Electricity and Water Board, has been appointed chief engineer (electrical and mechanical) to the newly formed Directorate of Municipalities, Ministry of the Interior, Baghdad. He took up his new duties on November 1st.

Dr. A. F. Philips was elected president of the Philips Company and Mr. P. F. S. Otten was appointed managing director at the annual meeting held in Holland recently. Mr. P. F. S. Otten, who is forty-one years of age, graduated at Delft University in 1923, and joined the Philips Company in the following year.

Sir Austen Chamberlain, M.P., has joined the board of the General Electric Co., Ltd. He is also a director of the Greater London & Counties Trust.

Mr. J. A. Prowse has been appointed street lighting assistant to the British Electrical Development Association.

Dr. J. McCombe, the author of the article on "Pole Transformers," which appears on page 703, served in France during the War while under age. He studied at the Royal Technical College and University, Glasgow, and holds the diploma in Engineering (Dipl. R.T.C.), Associateship in Engineering (A.R.T.C.), B.Sc., and Ph.D. His thesis on "Sparking Dangers from Coal Cutters" was awarded the Dr. James McKenzie prize for the best three years' thesis. Dr. McCombe was employed with the Dalmellington Iron & Coal Co. on colliery electrical practice, and later was on the overhead line contract staff of H. M. Spiers & Co., leaving this position in 1935 to take up the post of maintenance engineer with the Electricity Board for Northern Ireland. Subsequently he was promoted to transmission engineer.



Dr. J. McCombe

Mr. H. C. Margrett, assistant manager of the Southampton branch of the General Electric Co., Ltd., is shortly taking up an appointment at the Hong Kong branch of the General Electric Company of China, Ltd. His successor at Southampton is Mr. H. W. Wilson, of the G.E.C. Sales Department, London.

Mr. H. M. Hobart has, according to the *Electrical World*, been awarded the Samuel Wylie Miller Memorial Medal by the American Welding Society. Mr. Hobart developed mercury-arc rectifiers and is an authority on arc welding, design of dynamo-electric machinery, insulation and standardisation. He graduated from the Massachusetts Institute of Technology in 1889, and for the next five years was with the Thomson-Houston Co., and afterwards with the British Thomson-Houston Co. He left the latter company in 1899 and joined the A.E.G., Berlin, as consulting engineer, establishing an independent consulting practice three years later in London. In 1911 he became a consulting engineer with the American General Electric Co., a position which he still holds. Mr. Hobart is a founder and director of the American Welding Society, is a past vice-president of the American Institute of Electrical Engineers, and is a member of the Institution of Electrical Engineers.

Mr. H. Richards, 2, Tiber Street, Preston, has been appointed to the lighting fitting sales staff of Veritys, Ltd., and will operate in the Birmingham area. He has been with the Preston Corporation Electricity Department for the past ten years in charge of the Estimating Department, and has been lecturer on electrical installation work at the Preston Technical College. He takes up his new duties on December 1st.

Obituary

Mr. J. McLennan, a director of the Sloan Electrical Co., died on November 13th at his Hampstead home at the age of sixty-six. The interment took place on Monday last at Hampstead Cemetery.

Mr. F. Kilby.—The death is announced at the age of sixty-one, of Mr. Fred Kilby, J.P., vice-chairman of the Northampton Electric Light & Power Co., Ltd., and a director of the Rushden & District Electric Supply Co., Ltd.

The death occurred on November 10th of **Julie Marie Angele,** sister of the late Dr. S. Z. de Ferranti, F.R.S., at the age of 78 years.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Electricity House, Ltd.—Public company. Registered November 14th. Nominal capital, £50,000. Objects: To carry on the business of electricians, electrical, metallurgical, mechanical and chemical engineers, manufacturers of and dealers, including the taking or letting on hire or hire-purchase or deferred payment terms of all apparatus and things used in connection with electricity and gas, contractors for the construction, laying, testing and maintenance of works, machinery, cables, &c. The following persons have consented to be directors: R. W. Wickham, Beckfoot House, Nyddleton, nr. Ilkley; W. B. Woodhouse, The Croft, Bramhope, nr. Leeds; A. H. Meysey-Thompson, Lastingham, nr, York; H. C. Fraser, 4, Grosvenor Terrace, Grosvenor Road, Leeds, 6, and J. J. H. Stansfield, The Cairn Hydro, Harrogate. Solicitors: Barr, Nelson & Co., Leeds.

Associated Electric Vehicle Manufacturers, Ltd.—Private company. Registered November 11th. Nominal capital, £300,000 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers, hirers and repairers of and dealers in electric vehicles, carriages, vans, trucks, motor cars and other conveyances, suppliers of and dealers in electricity and other motive power and/or any electric or other vehicle, &c. The subscribers are: P. C. Smith and W. H. Barnes, both of Lloyds Buildings, Leadenhall Street, E.C.3. Registered office: Lloyds Buildings, Leadenhall Street, E.C.3.

Walsall Conduits, Ltd.—Private company. Registered November 12th. Nominal capital, £200. Objects: To adopt an agreement with W. H. M. Vendors, Ltd., to carry on the business of manufacturers of and dealers in conduits, conduit fittings, switches, plugs and electrical apparatus and accessories of all kinds and electrical, mechanical and general engineers. Power is taken to manufacture and deal in motor cars, motor and other cycles, aeroplanes and other aircraft and component parts, fittings and accessories for these. The subscribers are: T. E. Bowyer, 52, Ilderton Road, Rotherhithe, S.E.16; and F. J. Groombridge, 1, Corbett Road, Wanstead, E.11; and five others. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.2, and James F. Addison & Cooper, The Bridge, Walsall.

Rotary Valves, Ltd.—Private company. Registered November 9th. Capital, £1,000. Objects: To acquire patent rights of B. G. Horstmann in a rotary valve, and to carry on the business of manufacturers of, agents for the sale of, and dealers in valves, forgings, steel and armour plates, locomotives, boilers, dynamos, motors, pumps, wagons, carriages, steam, electrical and other machinery, &c. The directors are: W. H. Welch, Nirvana, Bransea Avenue, Hamworthy, Dorset, and three others. Solicitors: Cooke, Painter, Spofforth & Co., 28, Broad Street, Bristol.

Honeywell-Brown, Ltd.—Private company. Registered November 9th. Capital, £10,000. Objects: To carry on the business of manufacturers, producers, distributors, importers and exporters of, dealers in and agents for thermostats, humidity, temperature, pressure and safety controls, motorised valves, solenoid and diaphragm valves, &c. The subscribers are: R. M. Buller, St. Andrews, Weybridge, Surrey; and G. D. Naylor, 3, Hyde Park Place, W.2. H. W. Sweatt is permanent governing director and chairman. Solicitors: Parker, Garrett and Co., St. Michael's Rectory, Cornhill, E.C.

Eros (Universal), Ltd.—Private company. Registered November 11th. Capital, £100. Objects: To carry on the business of designers and manufacturers of and dealers in radio and electrical apparatus, appliances, accessories, materials, equipment and supplies, &c. The permanent directors are: E. Fawcett, 47, Parkhurst Court, N.7; and B. E. Malschinger, 86, Christchurch Avenue, N.W.6.

Electric Tool Development Co., Ltd.—Private company. Registered November 12th. Capital, £1,000. Objects: To carry on business as manufacturers of electric machines and motors, tools, equipment and accessories, &c. The subscribers are: S. D. De Lacy, 11, Highbury Hill, N.5; and F. W. Harris, 25, Rutland Street, Hampstead Road, N.W.1. Solicitors: Coulson & Coulson, 11, Queen Victoria Street, E.C.4.

Gritless Combustion Co., Ltd.—Private company. Registered November 14th. Capital, £100. Objects: To carry on the business of general, mechanical, electrical, motor, marine and constructional engineers, manufacturers of an appliance for collecting grit from industrial chimneys, &c. The life directors are: I. Scott-Mackenzie, M.I.M.E., 10-L, Hyde Park Mansions, N.W.1, and L. G. Holland, M.Inst.F., 26, Forest Court, Snaresbrook, E.11. Registered office: Bennett Chambers, 113, Hoe Street, E.17.

Castle Productions, Ltd.—Private company. Registered November 11th. Capital, £500. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in radio instruments, electrical appliances, washing and cleaning machines, wringers, mangles and machinery, &c. The directors are: H. Sunderland, 25, Lambourne Gardens, E.4; and W. H. Mayhew, 37, Hartington Road, N.9. Secretary: W. H. Mayhew. Registered office: 6a, Croxley Road, Fernhead Road, W.9.

Raylec, Ltd.—Private company. Registered November 12th. Capital, £800. Objects: To acquire the business of a television, electrical and wireless engineer, carried on by R. A. Meyrick as "Raymond Meyrick." The permanent directors are: R. A. Meyrick, 4, Buff Parade, High Street, Banstead, and S. W. J. Butters, 84, Guy Road, Beddington. Registered office: 4, Buff Parade, High Street, Banstead, Surrey.

McKay (Harrow), Ltd.—Private company. Registered November 13th. Capital, £500. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, dealers in electrical apparatus and appliances, to enter into hire-purchase agreements, &c. The permanent directors are: A. E. McKay and F. McKay, both of 27, Copperfield Avenue, Hillingdon. Solicitor: R. C. Garrod, 30, John Street, Bedford Row, W.C.1.

Reginald Maude, Ltd.—Private company.—Registered November 14th. Capital, £2,000. Objects: To carry on business as electrical engineers and general electrical installation contractors, &c. The directors are: R. Maude and Mrs. M. Maude, both of 66, New Crown Street, Halifax. Secretary: R. Maude.

Returns of Electrical Companies

Electrical Distribution of Yorkshire, Ltd.—The nominal capital has been increased by the addition of £1,000,000 in £1 unclassified shares beyond the registered capital of £2,200,000.

Cray Electrical Motors, Ltd.—Debenture charged on the company's assets, present and future, including uncalled capital, dated October 24th, 1936, to secure £500. Holder: A. W. Scott, 7, Staple Inn, Holborn, W.C.1.

F. J. Learmouth, Ltd.—Mortgage on the company's undertaking and property, present and future, including uncalled capital, dated October 20th, 1936, to secure £200. Holder: Fdk. J. Learmouth, 786a, Finchley Road, N.W.11.

Ever Ready Co. (Great Britain), Ltd.—Capital, £1,500,000 in £200,000 7 per cent. cumulative participating preference stock, £836,502 5s. ordinary stock and 1,853,991 ordinary shares of 5s. Return dated June 18th, 1936. All preference and ordinary stock taken up. £506,058 5s. paid on £98,000 preference stock and £408,058 5s. ordinary stock. £530,444 considered as paid on £102,000 preference stock and £428,444 ordinary stock. Mortgages and charges, nil.

Brentwood District Electric Installations, Ltd.—Capital, £1,000 in 20,000 shares of 1s. Return dated May 6th (filed June 2nd), 1936. All shares taken up. £1,000 paid. Mortgages and charges nil.

Premier Accumulator Co. (1921), Ltd.—Capital, £40,000 in £1 shares. Return dated September 30th, 1936. All shares taken up. £18,749 paid (£1 on 11,249 shares and 15s. on 10,000 shares). £18,751 considered as paid (£1 per share on 18,751 shares). Mortgages and charges, nil.

Ashton Electrical Co. (Preston), Ltd.—Mortgage debenture dated October 27th, 1936, to secure all moneys due or to become due from the company to Martins Bank, Ltd., charged on the company's undertaking and property, present and future, including uncalled capital (subject as to Fylde Road Mill, Preston, to mortgage dated January 24th, 1936).

Turnpress, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated October 21st, 1936, to secure £6,000. Holders: Branch Nominees, Ltd.

Richardsons, Westgarth & Co., Ltd.—Capital, £700,000 in 350,000 cumulative 6 per cent. preference and 350,000 ordinary shares of £1. Return dated July 14th, 1936. All shares taken up. £700,000 paid. Mortgages and charges: £25,605.

Guy V. Laycock, Ltd.—Capital, £10,000 in 10,000 shares of £1. Return dated July 27th, 1936. 5,200 shares taken up. £1,200 paid, £4,000 considered as paid. Mortgages and charges nil.

Lewes & District Electric Supply Co., Ltd.—Capital, £60,000 in 60,000 shares of £1. Return dated May 8 (filed June 23rd), 1936. 57,500 ordinary shares taken up. £57,500 paid. Mortgages and charges nil.

Caxton Electric Developments, Ltd.—Capital, £300,000 in 30,000 shares of £10. Return dated June 5th, 1936. 20,000 shares taken up. £70 paid, £199,930 considered as paid. Mortgages and charges nil.

Wigtownshire Electricity Co., Ltd.—Capital, £100,000 in £1 shares. Return dated July 28th, 1936. 90,000 shares taken up. £90,000 paid. Mortgages and charges nil.

Synclocks, Ltd.—Capital, £100 in 100 shares of £1. Return dated June 17th, 1936. Fifty-two shares taken up. £2 paid, £50 considered as paid. Mortgages and charges nil.

City Notes

The Calcutta Electric Supply Corporation has issued a circular to shareholders in which it states that the Corporation of Calcutta has given the company two years' notice of its intention to purchase on October 20th, 1938, so much of the undertaking as is within the area administered by or within the jurisdiction of the Corporation. According to the *Financial Times* the circular points out that competent advice has been obtained on the position generally, and directors are advised with assurance that on various grounds the notice purported to be given by the Calcutta municipality is neither valid nor effective. The directors also refer to the report of the committee of inquiry appointed by the Government of Bengal to examine the company's rates and charges, which committee had proposed a reduction in the domestic flat rate to 2 annas (net) per kWh. It is recalled that the directors brought the rate down to 2¼ annas (net) from June 1st, 1936. They now state that, in view of the growth of the company's business, it had been their intention to announce, on the first of the current month, a reduction in the domestic rate to 2 annas (net) at an early date, but the announcement has been postponed while the present position is being examined.

Cape Electric Tramways, Ltd., reports a profit of £21,667 for the year ended June 30th, as compared with £20,085 for the preceding year. This is after providing £48,096 for the balance of depreciation not provided by the subsidiary companies. To the profit is added £59,624 brought in, making £81,291. The dividend of 4 per cent. declared at the last annual meeting absorbed £19,649, leaving a balance of £61,642. It is again proposed to pay a dividend of 4 per cent. Capital expenditure during the year totalled £249,597, of which £213,907 was spent on the trolley-bus system in Capetown. There was a slight fall in the number of passengers carried by the trams and trolley-buses, from 29,254,228 to 28,835,298, while the motor buses and motor coaches showed an increase. The report points out, however, that during the transition period in the change over to trolley-buses certain of the tram routes were operated by motor buses.

Electrical Switchgear & Associated Manufacturers, Ltd., in its first report covering the period from May 14th, 1936 (the date of incorporation), to October 31st, 1936, states that the dividends and interest received have provided a realised surplus of £14,303. It is proposed to write off the whole of the preliminary expenses (£2,022), to set aside £1,906 for the half-year's dividend on the preference shares due on December 1st and to pay a dividend of 7½ per cent. actual on the ordinary shares less tax, leaving a balance of £3,226 to be carried forward. The company purchased the whole of the shares of Brookhirst Switchgear, Ltd., as from February 1st, 1936, and thus became entitled to the final dividend declared by that company to July 31st. This is included in the accounts now presented. Meeting: November 25th.

The Compania Hispano-Americana de Electricidad (Chade).—The shareholders have approved a proposal to transfer the company's concession and property in Argentina to the Compania Argentina de Electricidad of Buenos Ayres. The transfer is due to the wish of the Argentine authorities that concessions for public services should be in the hands of a native company constituted under national laws so as to facilitate control.

Enfield Rolling Mills, Ltd., reports a profit for the year ended September 30th last of £9,136, as compared with £6,089 in the preceding year. Debenture interest absorbs £9,000, other interest £3,670, directors' fees £1,674, and depreciation £20,802, leaving an adverse balance of £25,860, which with a deficit of £46,102 brought in makes a debit balance of £71,963 to be carried forward.

The Tata Power Co. reports net profits for the year ended June 30th of Rs.32,86,681, as compared with Rs.27,74,247 in 1934-35. The dividend on the ordinary shares for the year is Rs.65 (against Rs.55), tax free. The balance carried forward is Rs.4,54,293, against Rs.3,18,435 brought in. Power sold rose from 192,056,511 kW to 212,373,979 kWh.

The Lincolnshire and Central Electric Supply Co. is paying an interim dividend of 4 per cent. No interim was paid last year, but the final distribution was 6 per cent.

The City of Buenos Ayres Tramways (1904), Ltd., has announced a quarterly dividend of 1s. 3d. per £5 share, less tax.

Franco Signs, Ltd., has announced an interim dividend of 4 per cent. on the ordinary shares.

Electrical & Musical Industries, Ltd., held its annual meeting on November 13th, when Mr. A. Clark (chairman), who presided, said that the sale of radio receiving sets was larger than in the previous year, which had constituted a record, but their lower selling price was responsible for the greater part of the decrease in profits. Competition had increased with the rising demand and lower net prices were realised. Radio-gramophones and records were down both in units sold and amount obtained. With regard to television an order mentioned at the last meeting, obtained from the B.B.C. for the installation of a Marconi-E.M.I. system at Alexandra Palace, had been delivered and had passed all tests. They had also received another order from the B.B.C. for a travelling transmission station equipped with their "Emitron" cameras suitable for picking up scenes of both outdoor and indoor events. Their television receiving sets were now on sale. The household appliance business had completed its third year and the year under review showed an important increase over last year's sales of H.M.V. refrigerators. An electric iron had recently been developed which was meeting with marked success. Electric washing machines and irons for the home laundry had now increased their range of appliances; the manufacture of components for these articles at Hayes would give employment in sections of their factories not suitable for the manufacture of radio and television sets. It would also help to keep the employés busy the whole year round. In their search for more work for the lean season they were carrying on negotiations which, if successful, would relieve their labour situation. With reference to the future this was usually the busiest season for the manufacture of radio receiving sets and radio gramophones, and the present year was no exception. They had more orders in hand than the factory could immediately cope with, and they were satisfied with the position they held.

S. Smith & Sons (Motor Accessories), Ltd., reports a net profit for the year to August 1st of £175,579, as compared with £137,383 in 1934-35, to which is added £65,228 brought in, making £240,807. The dividend for the year on the preferred capital is 17½ per cent. (against 14 per cent.), and on the deferred capital 37½ per cent. (against 25 per cent.). The amount carried forward is £72,807.

The Southern Areas Electric Corporation, Ltd., is paying an interim dividend of 1½ per cent., actual less tax on the old ordinary shares (same). The new shares issued in June last will participate with the old shares in the final dividend.

The Associated Equipment Company recommends a final dividend of 13d. per unit of £1 stock, free of tax (against 10d.), making the total distribution for the year 18d. per unit.

Aron Electricity Meter, Ltd., has declared an interim dividend of 5 per cent. on the ordinary shares (unchanged).

The Cawnpore Electric Supply Corporation, Ltd., is paying an interim ordinary dividend of 3 per cent., less tax (same).

Ultra Electric (Holdings) is paying an interim ordinary dividend of 5 per cent.

Stocks and Shares

TUESDAY EVENING.

THIS week has seen the Stock Exchange occupied with the details of an exceptionally heavy settlement. The end-November account, which finished on Thursday in this week, has proved one of the most strenuous of the present twelve-month. The current account, which runs to December 5th, is likely to prove a much lighter affair, for business has fallen away to a considerable extent, both as regards investment and speculation. Gilt-edged stocks hold most of their strength. Central Electricity issues are rather better. London Electric Transport guaranteed is 10s. lower at 95½. The fall in London Passenger Transport "C" stock has been stayed, and at 98 the price shows a rally of a point.

Electricity Supply Issues

The slight weakness which has been apparent, for a week or two, in the market for home electricity supply shares, has, this week, become a little more marked. Price movements are not numerous, but, when they do take place, the trend is generally downwards. The most likely explanation for this tendency seems to be that present activity in the more speculative sections of the industrial market has tempted some holders to eschew the solid, but unspectacular security of their shares in favour of the more glittering opportunities for capital appreciation offered, for instance, by electrical equipment shares, or in other directions where the fruits of industrial recovery are gathered in more quickly, albeit less safely. Intrinsically, of course, the security of the supply companies' shares is stronger than ever before; the explanation of recent realisations obviously cannot be traced to that source. The most notable price movements of the past week are declines of ⅛ each in Midland Electric Power and Electric Supply Corporation, which stand now at 43s. 9d. and 58s. 3d. respectively. Midland Counties dropped 1s. to 40s., and others to lose ground were Metropolitans, 50s. 6d., British Power and Light, 31s. 6d., and Newcastles, 35s. 3d. Electrical Distribution of Yorkshire, at 47s. 6d., are quoted ex-rights to the preference shares which are being offered to ordinary shareholders, on a one-in-three basis, at 26s. The new shares have a 4s. premium over the offered price. The foreign section is notable for a fall in Palestine "A" from 51s. 6d. to 50s.

"Emmies"

The proceedings at the Electric and Musical Industries annual meeting served to stiffen the price of the shares, which, after a spell of weakness since publication of the accounts, has rallied to 24s. The chairman was no doubt correct, at least

from the market point of view, in his assumption that chief interest is centred on the company's progress in the field of television. Although profits from this source are unlikely to make their presence felt in the accounts for some time yet, his review of the subject makes it a matter of no great difficulty to visualise the possibility of television rivalling radio as a mainstay of the company's business and revenues. Meanwhile, the predominant partner in profit-earning capacity continues to be the radio. The heavy decline in last year's accounts illustrates the difficulties of trading satisfactorily in that direction, but a brighter view is taken of the company's prospects. Other sides of the business are, apparently, pulling an increasing share of their weight. On the basis of last year's 10 per cent. dividend, the present price of the 10s. shares allows a yield of nearly four guineas per cent. on the money.

A line on the value represented in the price of the shares by the television interest can be obtained through the prices of shares in Baird Television, which company is interested solely in that direction. The deferred shares, at 6s., are valued at nearly 2½ times their nominal value, while the 20 per cent. preferred, also of 2s. 6d. each, stand about 3s.

Electrical Equipment Shares

The electrical equipment share list makes rather a mixed showing, the irregularity of price movements during the past week reflecting a reactionary tendency in the industrial markets as a whole. The latter had been enjoying great activity, accompanied by rising prices, for several weeks, and a temporary halt at the present stage is welcomed as a natural and healthy correction to over-ebullience. Given freedom from Continental alarums, markets can reasonably be expected to continue, from a consolidated base, to show their appreciation of the ever-growing industrial activity in this country. In the electrical equipment market, the share of the moment continues to be Henley's, the price of which, ignoring surrounding hesitancy, has advanced further to 8⅛, as compared with 7⅞ before the bonus declaration. Johnson & Phillips, also, are a firm market at 51s. 3d., ex-dividend, a good impression having been created by maintenance of the interim dividend on this year's larger capital. Enfields yielded ⅛ to 5¾, and Enfield Rolling Mills 1s. to 19s. 9d. The latter company's report again shows a loss. Callenders and British Insulated held their ground, and London Electric Wires made further headway to 40s. 6d. Ericssons weakened to 56s. 3d. Crompton Parkinsons show a 2s. 6d. loss at 4½, and Lancashire Dynamos reacted to 3 7/16: smaller declines took place in English Electrics, now 25s. 6d., Associated Electricals, 54s., and Switchgear & Cowans, 19s. 3d. Laurence, Scott & Electromotors "A" are in demand at 11s. 6d. Young Accumulators, at 2s. 9d., made little response to the latest developments. Electrical Switchgears quickly recovered the dividend deduction, rising to 30s. 9d., ex-dividend, on the progressive report.

Wall Street Securities

By its unexpectedness, and by the uncertainty which it has created, the report of Mr. Roosevelt's intentions with regard to foreign money in Wall Street inevitably gave rise to a measure of perturbation in markets on both sides of the Atlantic. The prospect of any restriction being imposed upon foreign dealings in American securities is, of course, unpopular and irksome to the investor, and anathema to the speculator. Nevertheless, to anyone who has followed recent gold movements to the United States, it is plain enough that a very heavy flow of funds is crossing the Atlantic from Europe, and the presence of so much "hot" money—the term applied to funds liable to sudden withdrawal—has created a problem which warrants the proposed inquiry. The difficulty of predicting the form which might be taken by legislation, based on the findings of the inquiry, does not prevent lively discussion of the question in London markets. A revival of the capital profits tax on foreigners is suggested, in some quarters, as a possibility, but such speculation must necessarily be very nebulous at the present stage. American utility stocks and shares have reacted from the best prices recently touched; there has been, however, no pressure to sell on the part of the genuine investor.

Miscellaneous Matters

Enthusiasm for Anglo-Argentine Tramway issues has cooled: prices have come back appreciably from the levels to which they were carried soon after the announcement of the tripartite currency agreement. The price of the first preference, after stagnating for many months around the 1s. mark, has lately been within sight of 10s., but is now back to 5s. 9d. The other issues have behaved similarly, if less abruptly.

Cable and Wireless stocks lost much of the previous week's firmness; the preference shed a point, and the "A" ordinary ½, the respective prices being now 102½ and 21. Dollar communication stocks turned easier along with other Wall Street descriptions. International Telephone and Telegraph fell from 14⅝ to 14, after being 13⅞, Western Unions from 96¼ to 94½, and American "Tel. and Tel." from 188½ to 186½. Among foreigners, Oriental Telephone and Anglo-Portuguese Telephone are firm spots, at 3 5/16 and 27s. respectively.

The iron and steel group is disposed to be a trifle reactionary. Speculation has drifted into other markets. One of the latter is that for rubber shares. After a few days of hectic excitement, the exuberance subsided, but, with the price of the produce well maintained, rubber shares continue to attract public attention.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend. Previous.	Last.	Price. Nov. 17.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 6
City of London	1	7½	7½	37/6	—	4 0 0
Clyde Valley	1	7	8	46/–	—	3 9 7
County of London	1	10½	10½	54/–	—	3 17 9
Edmundson's 7% Pref.	1	7	7	36/–	—	3 17 9
Do. Ord.	1	8	8	46/–	—	3 9 7
Elec. Dis. Yorkshire	1	9	9	47/6	+r	3 15 9
Elec. Fin. and Securities	1	12½	12½	3½	—	4 0 0
Elec. Supply Corporation	1	11	11	58/3	−¼	3 15 7
Lancs Light and Power	1	7½	7½	38/6	—	3 18 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	39/6	—	4 1 1
London Power Deb. Red.	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	50/6	−6d.	3 19 3
Midland Counties	1	7	7½	42/–	−1/–	3 15 0
Mid. Elec. Power	1	8	8	43/9	−¼	3 13 1
North Eastern Electric Ordinary	1	6	6	33/–	—	3 12 7
Do. 7% Pref.	1	7	7	36/–	—	3 17 9
Northampton	1	10	10	51/3	—	3 18 1
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 1
North Met. Elec. Ordinary	1	10	10	55/–	—	3 12 9
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 6
Scottish Power	1	8	8	41/–	—	3 18 1
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 6
Yorkshire Elec.	1	8	8	44/–	—	3 12

Public Boards.

Central Electricity, 1950–70	Stock	5	5	120	—	4 3 5
Do. 1955–75	„	5	5	122	+1	4 2 0
Do. 1951–73	„	4½	4½	114	—	3 19 0
Do. 1963–93	„	—	3½	104	—	3 7 4
London Elec. Trans. Gtd.	„	—	2½	95½	−½	2 12 4
London & Home Counties, 1955–75	„	4½	4½	115	—	3 18 3
London Passenger Transport, A	„	—	4½	126½	—	3 11 2
Do. do. B	„	—	5	129½	—	3 17 9
Do. do. C	„	3½	4	98	+1	4 1 8
West Midlands Joint Elec. 1948–68	„	—	5	116½	—	4 5 10

Telegraph and Telephone.

American Tel. & Tel.	$100	9	9	186½	−2	4 16 6
Anglo-Am. Tel. Pref.	Stock	6	6	128½	—	4 13 5
Do. Def.	„	1½	1½	30	—	5 0 0
Cable & Wireless 5½% Pref.	„	4½	5½	102½	−1	5 7 3
Do. A. 7½% Ord.	„	Nil	Nil	21	−½	—
Do. B. Ord.	„	Nil	Nil	7	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14½	—	3 3 4
Do. Do. Pref.	10	6	6	14½	—	4 2 9
Great Northern Tel.	10	20	20	47	—	4 5 1
Marconi-Marine	1	10	7½	36/3	—	4 2 9
Oriental Telephone Ord.	1	12*	12*	3 5/16	+ 1/16	3 12 6

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/9	−¼	—
Do. do. 2nd Pref.	5	Nil	Nil	5/–	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	17½	—	—
British Electric Traction Df. Ord.	„	5	5	1700xd.	+4	—
Do. do. Pref. Ord.	„	8	8	179½xd.	+1	4 9 2
Brazil Traction	100	—	30 cts.	18½	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	104½	—	4 15 8
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	47	−3	—
Victoria Falls Ord.	1	20	12	76/3	+6d.	3 3 0
West Riding	1	5	6½	50/–	—	2 12 9

Manufacturing Companies.

Aron Electricity Ord.	1	10	15	62/6	—	4 16 1
Assoc. Elec. Ord.	1	6	8	54/–	−1/–	2 19 2
Do. Pref.	1	8	8	39/6	—	4 1 0
Babcock & Wilcox	1	8	8	50/6	−1/–	3 3 4
British Aluminium Ord.	1	7½	7½	45/–	—	3 6 6
British Insulated Ord.	1	15	20	6½	—	3 5 5
Brush Ord.	Stock	Nil	Nil	42½	−1	—
Callender's	1	15	15	4 11/16	—	3 3 8
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	4½	−½	—
Do. 8% Pref.	1	8	8	2	—	4 0 0
Electric Construction	1	3½	7	42/6	+½	3 5 9
Enfield Cable Ord.	1	25	25	5¾	−¼	4 6 10
English Electric	1	Nil	Nil	25/6	−6d.	—
Do. Do. Pref.	1	Nil	Nil	28/6	—	—
Ericsson Tel.	5/–	24	20*	56/3	−¼	1 15 9
Ever Ready	5/–	35	35	29/6	−6d.	5 18 8
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	35/–	—	3 14 4
Do. Ord.	1	10	15	94/–	—	3 3 10
Henleys	1	30	30	8 1/16	+ ¼	3 8 2
Do. 4½% Pref.	5	4	4½	5¾	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	51/3xd.	+9d.	3 8 0
Lancashire Dynamo	1	5	10	3 7/16	−¼	2 18 2
Siemens Ord.	1	4	6	35/–	—	3 8 7
Telegraph Construction	£1	Nil	Nil	35/–	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be numbered and abridged and all subsequent proceedings will be taken.

1935

1408. "Television and like systems." E. C. Cork, M. Bowman-Manifold and C. L. Faudell. January 15th, 1935. (Cognate application 23109/35.) (455375.)

5346. "Electric-discharge devices." British Thomson-Houston Co., Ltd. February 19th, 1934. (455376.)

5715. "Conduit systems for electrical wiring." E. B. Sargent and H. H. Robertson Co. February 22nd, 1935. (455435.)

7206. "Electric signal transmission lines." A. D. Blumlein and J. Hardwick. March 7th. 1935. (Cognate application 32791/35.) (455492.)

8898. "Generators of electrical oscillations." E. L. C. White. March 21st, 1935. (455497.)

10624. "Electrical reproduction of movement or displacement at a distance." A. R. Thomas. April 5th, 1935. (455498.)

11706. "Electron-discharge devices." Ferranti, Ltd., and M. K. Taylor. April 16th, 1935. (455499.)

11868. "High-frequency signalling systems." R. J. Berry (C. Lorenz Akt.-Ges.). April 17th, 1935. (Convention date not granted.) (455500.)

11904. "Cathode-ray tube circuit arrangements for television and like purposes." J. E. Keyston and L. F. Broadway. April 17th, 1935. (455555.)

11956. "Electric fusible cut-outs." Switchgear and Equipment, Ltd., and A. G. H. Axley. April 18th, 1935. (455383.)

12162. "High-frequency coupling systems for wireless reception." Hazeltine Corporation. May 31st, 1934. (455619.)

12391. "Sound-translating devices." Electrical Research Products, Inc. April 25th, 1934. (Addition to 382268.) (455635.)

12416. "Electric cut-outs, connectors and the like." E. T. G. Donovan. April 25th, 1935. (455559.)

12417. "Electric cut-outs, connectors and the like." G. O. Donovan, W. Donovan and E. T. G. Donovan. April 25th, 1935. (Addition to 335158.) (455560.)

12512. "Electric lamp and like fittings." J. Allan. April 26th, 1935. (455645.)

12558. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd., and A. A. Linsell. April 26th, 1935. (455649.)

12560. "Electron-discharge devices, and circuit arrangements incorporating the same." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust and G. F. Brett. April 26th, 1935. (Addition to 403973.) (Cognate application 15166/35.) (455650.)

14589. "Electric resistance heating elements." Walsall Conduits, Ltd., W. Whaley and A. E. Read. May 18th, 1935. (455507.)

15013. "Generation of alternating or pulsating currents having a high degree of frequency stability." E. A. Speight and W. G. Radley. May 23rd, 1935. (Cognate application 15016/35.) (455441.)

15903. "Synchronous electric motor-driven gearing." Measurement, Ltd., R. Connor and C. F. Clifford. May 31st, 1935. (455442.)

15905. "Permanent magnets of electricity meters." Measurement, Ltd., R. Connor and C. F. Clifford. May 31st, 1935. (455513.)

16933. "Automatic devices for the continual feed of kinematograph arc-lamp electrodes." J. Sturgeon and Cinesales, Ltd. June 12th, 1935. (455515.)

17723. "Grids for electric-discharge devices." M-O Valve Co., Ltd., D. A. Boyland and S. M. Duke. June 20th, 1935. (455446.)

18613. "Lamps." G. A. King. June 28th, 1935. (455447.)

18645. "Anchorage members for chain and other flexible members for operating electrical switches." C. H. Parsons, Ltd., and G. B. Handley. June 29th, 1935. (455522.)

18810 and 18812. "Electric cable systems." Callender's Cable & Construction Co., Ltd. (Okonite-Callender Cable Co., Inc.). July 1st, 1935. (455662/3.)

21305. "Electric arc heating torches in which hydrogen or the like is directed through the arc on to the work to be heated." Metropolitan-Vickers Electrical Co., Ltd. (General Electric Co.) July 26th, 1935. (455450.)

21307. "Electric arc heating torches in which hydrogen or the like is directed through the arc on to the work to be heated." R. Embleton and Metropolitan-Vickers Electrical Co., Ltd. July 26th, 1935. (455451.)

21376. "Thermionic amplifiers." Standard Telephones & Cables, Ltd. September 3rd, 1934. (455665.)

22674. "Telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. August 12th, 1935. (455669.)

22703. "Electric heating installations for soldering and like purposes." G. R. McCarthy. November 7th, 1934. (455455.)

24894. "Electric thermal switches." Unity Heating, Ltd., and C. C. Turner. September 6th, 1935. (455397.)

25352. "Electric fuses." Westinghouse Electric & Manufacturing Co. September 18th, 1934. (455670.)

27381. "Electric candle lamp." Vereinigte Glühlampen und Elektricitäts Akt.-Ges. October 23rd, 1934. (455459.)

29275. "Phase-sequence indicators." British Thomson-Houston Co., Ltd. October 25th, 1934. (455402.)

31347. "Electrical plug-and-socket connections." C. H. Parsons, Ltd., and G. B. Handley. November 13th, 1935. (Cognate application 33233/35.) (455404.)

31679. "Coaxial conductor electric cables." Standard Telephones & Cables, Ltd. January 23rd, 1935. (Addition to 417929.) (455535.)

31687. "Electrically operated fans." E. Marelli & Cie Soc. Anon. September 16th, 1935. (455676.)

32636. "Electric clocks." Junghans Akt.-Ges., Geb. December 1st, 1934. (455536.)

33470. "Automatic electromagnetic interrupter for oscillating motions of bells and the like." A. J. H. Slégers. December 3rd, 1935. (Convention date not granted.) (455680.)

33563. "Process for electrolytic production of esters." Nitroglycerin Aktiebolaget. December 10th, 1934. (455463.)

34920. "Variable electric inductances for high-frequency circuits." Johnson Laboratories, Inc. June 26th, 1935. (455573.)

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1787. "Suppression of electrical radiations." C. D. Gwinn, and Telegraph Condenser Co., Ltd. January 20th, 1936. (445541.)

2295. "Recording devices for use in tele-communication systems." Standard Telephones & Cables, Ltd. March 7th, 1935. (455414.)

3948. "Variable electric condensers." R. Bosch Akt.-Ges. February 12th, 1935. (455418.)

5741. "Electric indicating or registering arrangements especially for balances." F. Lewin (C. Schenck Eisengiesserei & Maschinenfabrik Darmstadt Ges.) February 26th, 1936. (455473.)

6726. "Metal vapour rectifiers." Siemens-Schuckertwerke Akt.-Ges. March 8th, 1935. (455548.)

6930. "Holders for securing telephone or other reference books." Terag Telefon-Reklame Akt.-Ges. and G. Graber. March 7th, 1936. (455549.)

7073. "Luminous electric-discharge tubes." Soc. Anon pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude-Paz & Silva. December 7th, 1935. (455683.)

7633. "Protecting case for mica condensers." W. Mock and Monette Asbestdraht Ges. March 13th, 1936. (455475.)

10010. "Electrical circuits associated with cathode-ray tubes." Fernseh Akt.-Ges. April 9th, 1935. (455479.)

11298. "Method and apparatus for laying submarine cables." Siemens-Schuckertwerke Akt.-Ges. June 4th, 1935. (455584.)

11760. "Rotary electric switches for use in electric cookers." Diamond H Switches, Ltd. March 14th, 1936. (455423.)

12327. "Tubular electric incandescent lamps." British Thomson-Houston Co., Ltd. May 1st, 1935. (455586.)

12582. "Electric-discharge tubes." British Thomson-Houston Co., Ltd. May 4th, 1935. (455591.)

13171. "Apparatus for the electrolysis of aqueous solutions of sodium sulphate." I. G. Farbenindustrie Akt.-Ges. October 4th, 1935. (455429.)

15100. "Means for eliminating radio disturbances in connection with grid-controlled rectifiers." British Thomson-Houston Co., Ltd. May 28th, 1935. (455428.)

15400. "Modulators and demodulators for electric signals." Siemens & Halske Akt.-Ges. June 8th, 1935. (455489.)

18862. "Scanning systems for television and like cathode-ray tube apparatus." Telefunken Ges. für Drahtlose Telegraphie. July 8th, 1935. (455598.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 11th:—

Airistrocrat (lettering and design). No. 571242. Class 6. Electric fans.—The Torrington Manufacturing Co., Torrington, Conn., U.S.A. (British representatives: Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.)

Hellesens. No. 564431. Class 8. Electric condensers.—Hellesen's, Ltd., 260-8, Gray's Inn Road, W.C.1.

Olympic. No. 571289. Class 8. Electrical apparatus for dressing, undulating and curling the hair.—Gallia, Ltd., 26a, Albemarle Street, Piccadilly, W.1.

Genex. No. 571164. Class 13. Filler rods and electrodes for use in electric welding, all being metal goods.—Murex Welding Processes, Ltd., Ferry Lane Works. Forest Road, Walthamstow, E.17.

Ventraflex. No. 571957. Class 18. Electric and gas fires, &c.—Builders Merchants (London), Ltd., Anchor Wharf, Windmill Lane, Thames Ditton, Surrey.

Aberoid. No. 571649. Class 50. Material made from casein or synthetic resin sold in the form of rods, tubes and sheets for industrial purposes.—The Aberdeen Combworks Co., Ltd., 40, Hutcheon Street, Aberdeen.

Scottish E.P.E.A. Dinner

The part which the Electrical Power Engineers' Association is playing in raising the status of electrical engineers was commented upon at the annual dinner of the Scottish Division in Glasgow recently. Bailie Hector M'Neill, who proposed the toast of "The Association," expressed the hope that with the progress of the Galloway and the Grampian power schemes there would be a further increase in the membership. Mr. J. F. Sarvent, president of the Association, in responding, emphasised that they had, in the main, received those things which they desired, and it was now up to them to put something back into the industry. From both the National Joint Board and the District Joint Boards they had received a "square deal." The toast of "The Guests" was proposed by Mr. J. Eccles, Edinburgh, and replied to by Major Herbert Bell, general manager of Glasgow Corporation Electricity Department.

Spectrographic Analysis of Tin

The spectrographic analysis of tin carried out by the British Non-Ferrous Metals Research Association has been extended to include the quantitative determination of aluminium, cadmium and zinc in tin. This new work was done with the aid of funds provided by the International Tin Research and Development Council, which has published the results in Technical Publication Series A, Number 46.

For the determination of impurities by means of spark spectra photography both arc and spark methods were investigated. As an appendix to the paper there is a description of the electrolytic method of refining tin in the laboratory for the purposes of obtaining spectrographically pure tin for use in the preparation of standard alloys containing very small amounts of the alloying constituents.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Annan.—Houses (52); burgh surveyor.

Appleby Magna (LEICESTERSHIRE).—School; C.E. managers.

Atherton.—Houses (36), Hag Fold estate; F. L. Boydell, U.D.C. surveyor, Town Hall.

Bebington.—Houses (80), Oakleigh Grove estate; H. W. Lloyd, Ltd., builders.

Bedfordshire.—Police court house, Leighton Buzzard; county architect, Bedford.

Belford (NORTHUMBERLAND).—Houses, Ellingham, Bamburgh and North Sunderland; R.D.C. surveyor.

Berkshire.—School, Windsor (£22,500) for County E.C.

Birkenhead.—Headquarters (£30,000) for the Committee of the Young Men's Christian Association, Grange Road; H. Thomas, architect, Britannia Buildings, Fenwick Street, Liverpool.

Birmingham.—Factory, Alvechurch, for the Flexible Manufacturing Co., Ltd., Alvechurch; H. H. Matthews, builders, Alvechurch. Factory, Barr Street, for Deutsch & Brenner, Ltd., Hurbury Street; Whitehouse & Sons, Ltd., builders, Monument Road.

Blyth.—Cinema, Union Street, for Wallaw Pictures, Ltd. (£30,000); G. Towers, builder, 77, Union Street.

Bordon (HAMPSHIRE).—Cinema for South Down Cinemas, Ltd., Southsea; Kemp & Tasker, architects, 10, Great James Street, London, W.C.1.

Bowburn (Co. DURHAM).—Houses (36); Lane, Fox & Co., Ltd., builders, Norton-on-Tees.

Bradford.—Cinema, Manchester Road and Town Hall Square; Odeon Theatres, Ltd. Works and offices, Woodhead Lane; F. P. Leach & Sons, Ltd., builders, 1, Waterside Road.

Burton Latimer.—Houses (72), near Finedon Station Road; W. G. & H. J. Bunning.

Canterbury.—Premises, on site of St. George's Theatre, for the Co-operative Society.

Carlisle.—School (600 places), Currock, for City E.C.; director of education.

Chester-le-Street.—Premises, Front Street, for Montague Burton, Ltd.; staff architect, Hudson Road Mills, Leeds.

Chippenham.—Houses (23), Langley Road, for A. Bush.

Coalville (LEICESTERSHIRE).—Cinema, Jackson Street, for C. K. Deeming.

Coventry.—Bank, High Street, for Martins Bank, Ltd., Liverpool.

Darlington.—School, near the Guerney Pease school, for E.C.; borough engineer.

Dartford.—Houses (156); R.D.C. surveyor.

Derby.—Staff college, Osmaston Park, for the London, Midland and Scottish Railway.

Dumbarton.—Factory for the Blackburn Aircraft, Ltd.; manager, Messrs. Denny, shipbuilders, Dumbarton.

Durham.—Houses (139); R.D.C. surveyor. School, Eighton Banks, Gateshead-on-Tyne, for County E.C.; F. Willey, county architect, 34, Old Elvet, Durham.

Easington (DURHAM).—Houses (100), South Hetton, for the North-Eastern Housing Association, Ltd., on behalf of the Rural District Council; J. W. Hays, architect, Central Chambers, Wingate.

Essex.—Schools, Buckhurst Hill (£42,842), Upshire (£11,204), and West Mersea (£22,700); county architect.

Glasgow.—Houses (80), Knightswood; architect, Corporation Housing Dept. Cinema, Springburn, for the Scottish Cinema and Variety Theatres, Ltd.; C. J. McNair & Elder, architects, 272, St. Vincent Street. Elementary school, Elba Lane, for E.C. Institution, Caldwell estate, and extensions to Stoneyetts Institution (£95,000); city engineer.

Great Yarmouth.—Houses (30), Lawn Avenue; H. A. Holmes & Sons, Ltd. Houses (150), North Denes estate; borough engineer. Council offices, Hall Plain (£21,134); R. H. Carter & Son, Ltd.

Guildford.—Houses (164), Westborough (£52,892); W. A. Harding, Ltd.

Hastings.—Nurses' home, Municipal hospital (86 bedrooms); S. Little, borough engineer.

Hertfordshire.—Evening institute, Hertford (£35,000), and schools, Hitchin (£44,800), and Baldock (£22,400), for County E.C.; director of education, Hertford.

Holywell.—Houses (150), Gowdal estate; Whiteley & Storey, builders, 108, Old Hall Road, Sale.

Hyde.—Houses (124), Gee Cross; Dean & Whipp. Cinema, Travis Street; Rossett Estates, Ltd.

Irish Free State.—(BLACKROCK, CO. DUBLIN).—Extensions and alterations to St. Augustine's Colony for mental defectives, Obelisk Park, for the Hospitaller Order of St. John of God; T. F. McNamara & Sons, architects, 6, Dawson Street, Dublin. (CORK).—Houses (66), Gurranbraker (City of Cork) for the Corporation of Cork; J. R. Boyd Barrett, architect, 61, South Mall, Cork. (DROGHEDA, Co. LOUTH).—Houses (113); borough surveyor, Courthouse, Drogheda (ENNIS, CO. CLARE).—Houses (157) for the working classes; F. Dowling, engineer, Town Hall, Ennis.

Irlam.—Houses and bungalows, Lords Street estate, Cadishead and Moorfield estate; U.D.C. surveyor.

Isle of Ely.—Home for mental defectives; March County Mental Defectives Committee (£30,000).

Kent.—Extensions to Sheerness technical institute; county hospital, Pembury; secondary school for girls, Dover; and nurses' home, county hospital, Chatham; county architect, Maidstone.

Lancaster.—Clothing factory, Dallas Road, for Decorous Garments, Ltd., 31, Castle Hill; T. Johnson, builders, 86, Bowerham Road.

Leeds.—Estate development in Buckstone Road and King's Lane, Alwoodley; Eddison trustees.

Lincoln.—Houses (116) and bungalows, Bracebridge Hall estate; W. Palmer, acting borough surveyor. Extensions, city hospital; city surveyor.

Liverpool.—Factory for J. R. Carmichael, 290, Great Horner Street.

Llandudno.—Hospital, Maesdu (£50,000); N. McKellor, assessor architect, Newcastle-on-Tyne.

Llanrwst.—Cinema, Plas-yn-Dre estate; S. C. Foulkes, architect, Colwyn Bay.

London.—(CHELSEA).—Houses (26) and flats, Draycott Avenue; Wills & Kaula, 22, Southampton Street, W.C.1. (LAMBETH).—Redevelopment of Murphy Street area (£66,000); L.C.C. architect. (POPLAR).—Flats (50), Vesey Street (£29,000); L.C.C. architect. (WHITE CITY, W.12).—Flats (2,286), Exhibition site (£1,437,000); L.C.C. Housing and Public Health Committee.

Maidstone.—Houses (24), Yalding; T. A. Busbridge, R.D.C. surveyor, 26, Tonbridge Road.

Manchester.—Houses (33), Park Road and Cranston Grove, Northern Etchells; H. Hankinson, architect, 3, The Downs, Altrincham.

Motherwell.—Houses, Caledonian Street (£12,000); L. Costley, burgh surveyor, Town Hall.

Newport (MONMOUTHSHIRE).—Paper board factory, Alexandra Docks, for Thomas Owen & Co., Ltd., Ely, Cardiff; W. Harrison, chairman.

Norfolk.—School, Wymondham, for County E.C.; director of education, Norwich.

Nottingham.—Cinema, Invincible Cinema, Ltd.

Ossett.—School, for E.C.; G. Kendall, architect, 10, Bank Street.

Oxted (SURREY).—Hospital (£20,000), electrical work; H. E. Mathews, architect.

Penrith.—Houses (56), Careleton; J. Kitchen & Sons. Houses (34), Croft estate; U.D.C. surveyor.

Peterborough.—Printing works, for G. C. Caster & Co., Chapel Street; W. C. Waymouth, architect, Gwydir Chambers, 105, High Holborn, London, W.C.2.

Rothwell.—Houses and bungalows, for aged persons, Robin Hood estate; F. Hartley, architect, Council Offices, Rothwell, near Leeds.

Runcorn.—Cinema, for the Cheshire County Cinemas, Ltd.; G. Owen, architect.

St. Albans.—Houses (72), Colney Heath, for E. Stevens.

St. Helens.—Cinema, Tontine Street, for the Odeon Theatres, Ltd., Cornhill House, Bennetts' Hill, Birmingham.

Scarborough.—Technical institute and school for North Riding E.C.; J. R. White, county architect, County Hall, Northallerton.

Sedgley.—Clothing factory, Louise Street; Clifford Williams & Son, Ltd.

Shropshire.—Premises for Priory Girls' school, Shrewsbury, for County E.C. Two schools, Wellington; county architect.

Somerset.—Police station and courts, Minehead; A. J. Toomer, county architect, Park Street, Taunton.

Southam.—Houses, Bishop's Itchington; R.D.C. surveyor.

Spalding (LINCOLNSHIRE).—Houses (36); G. A. Thurston & Sons, builders.

Southampton.—Buildings, for King Edward Grammar School (£72,533), for E.C.

Stafford.—Extensions, including X-ray and electrical department, General Infirmary (£30,000); William Sharratt, Ltd., builders, Wolverhampton.

Staffordshire.—Technical college, Victoria Road, Stamford; director of education.

Stockton-on-Tees.—Offices, workshops and garages, Boathouse Lane, for Fordy & Son, Durham Road; G. P. Stainsby, architect, 25, High Street.

Stoke-on-Trent.—Cinema, Hill Street; A. Glyn Sherwin, architect, Rectory Chambers, Newcastle, Staffordshire.

Stretford.—Houses (206), Barton estate; borough engineer.

Sunderland.—School for defectives (£14,221), for E.C.

Surrey.—Schools, Egham, Merton, Morden and Camberley, for County E.C.; secretary, Kingston-on-Thames.

Swansea.—Cinema, Eversley Road, Sketty, for Oscar Dennis.

Wakefield.—Houses (98), Eastmoor estate; G. Crook & Sons, Ltd. School of Arts and Crafts, Bell Street (£90,000), for E.C.

Wallsend-on-Tyne.—Houses (64), Coast Road, for Elswick Investment Trust, Ltd.; Mr. Errington.

Walton-on-Thames.—Houses (30), Phoenix Road; U.D.C. surveyor.

Warwick.—Cinema, Coton End, for Rollason & Clift, 5a, Union Street, Birmingham.

Watford.—Electricity showrooms and offices (£21,480); G. & J. Waterman, Ltd., builders. Houses (120); Watts & Co., builders, 31a, High Street, Sutton, Surrey.

West Hartlepool.—Houses (34), Borrowdale Street, for G. W. Hatherley; J. J. Dobson, architect, 1, Scarborough Street. Swimming baths, Throston Street; borough engineer.

Whitby.—Isolation hospital; H. Davies, architect.

Worcestershire.—Extensions to Isolation Hospital, Hill Top, Bromsgrove (£32,771), for C.C.; Mr. Rowe, county architect, Worcester.

Yorkshire.—Schools, Richmond (£26,100), Saltburn (£45,000), and Eston (£46,000), for North Riding E.C.; director of education, Northallerton.